# AFRL-RH-WP-TR-2017-0075

# Comparative Assessment of Torso and Seat Mounted Restraint Systems using Manikins on the Horizontal Impulse Accelerator

**Mr. Chris Perry**
**Mr. Chris Burneka**
**Mr. John Buhrman**
**Warfighter Interface Division**

**Ms. Rachael Christopher**
**ORISE**

**Mr. Chris Albery**
**Infoscitex**

## Nov 2017
## Interim Report

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**AIR FORCE RESEARCH LABORATORY**
**711 HUMAN PERFORMANCE WING,**
**AIRMAN SYSTEMS DIRECTORATE,**
**WRIGHT-PATTERSON AIR FORCE BASE, OH 45433**
**AIR FORCE MATERIEL COMMAND**
**UNITED STATES AIR FORCE**

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//signed//
CHRISTOPHER M. BURNEKA
Work Unit Manager
Applied Neuroscience Branch

//signed//
CLIFFORD N. OTTE
Chief, Applied Neuroscience Branch
Warfighter Interface Division

//signed//
KRISTOFFER A. SMITH-RODRIQUEZ, LTCOL
Chief, Warfighter Interface Division
Airman Systems Directorate

# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



**1. REPORT DATE** *(DD-MM-YY)*
01-11-17

**2. REPORT TYPE**
Interim

**3. DATES COVERED** *(From - To)*
July 2014 to May 2015

**4. TITLE AND SUBTITLE**
Comparative Assessment of Torso and Seat Mounted Restraint Systems using Manikins on the Horizontal Impulse Accelerator

**5a. CONTRACT NUMBER**
FA8650-14-D-6500-0001

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**
62202F

**6. AUTHOR(S)**
Mr. Chris Perry*
Mr. Chris Burneka*
Mr. John Buhrman*
Ms. Rachael Christopher**
Mr. Chris Albery***

**5d. PROJECT NUMBER**
5329

**5e. TASK NUMBER**
08

**5f. WORK UNIT NUMBER**
H0GW (53290812)

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
ORISE**
Oak Ridge Institute for Science and Education
Oak Ridge, TN 37831 USA

Infoscitex Corporation***
Colonel Glenn Hwy, Suite 210
Dayton , Oh 45431-4027

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
Air Force Materiel Command*
Air Force Research Laboratory
711 Human Performance Wing
Airman Systems Directorate
Warfighter Interface Division
Applied Neuroscience Branch
Wright-Patterson AFB, OH 45433

**10. SPONSORING/MONITORING AGENCY ACRONYM(S)**
711 HPW/RHCP

**11. SPONSORING/MONITORING AGENCY REPORT NUMBER(S)**
AFRL-RH-WP-TR-2017-0075

**12. DISTRIBUTION/AVAILABILITY STATEMENT** DISTRIBUTION STATEMENT A. Approved for public release: distribution is unlimited.

**13. SUPPLEMENTARY NOTES**
88ABW Cleared 11/30/2017; 88ABW-2017-6051.

**14. ABSTRACT** The Aircrew Biodynamics and Protection (ABP) Team of AFRL (711 HPW/RHCPT) and their in-house technical support contractor, Infoscitex, conducted an experimental effort involving a series of -X-axis and –X/+Z-axis impact tests on the Horizontal Impulse Accelerator (HIA). The purpose of the tests was to perform a comparative assessment of seat and torso mounted restraint systems during both horizontal and combined horizontal impacts. Parametric assessment was also conducted with other parameters including acceleration magnitude, headrest position relative to seatback tangent plane, and head supported mass (helmet system). Overall, the series of comparative assessments indicated that a forward headrest of 2.5” relative to the seat back had minimal effect on the biodynamics response regardless of seat tilt position. The heavy helmet of 5 lb with a forward CG shift generated greater biodynamic responses for both the LOIS and the LARD manikin with the LOIS Nij and neck tension values exceeding the AFRL limits. The comparative assessment with the SCH or seat-mounted harness indicated that this configuration with no seat tilt had minimal effect on biodynamic neck and chest response but reduced the lumbar spine responses in both manikins; however, with the seat reclined, the SCH increased neck tension and lumbar flexion in both manikins. The simulated JSF-style ejection seat generated greater biodynamic response in the neck in both LOIS and LARD at both seat tilt configurations, and generated greater biodynamic response in the LOIS in the lumbar spine with the upright seat configuration. All the data sets collected for this effort will be used in a future human impact study with similar comparative assessments for prediction of biodynamic response at acceleration levels beyond what is allowed for human test subjects.

**15. SUBJECT TERMS** Horizontal Impact Acceleration, Horizontal Impulse Accelerator, LOIS Manikin, LARD Manikin, Forward Headrest, JSF Helmet, Torso Harness, Simplified Combined Harness, SCH, Seat Mounted Harness, Reclined Seat Back, Parametric Assessment

| 16. SECURITY CLASSIFICATION OF: a. REPORT | b. ABSTRACT | c. THIS PAGE | 17. LIMITATION OF ABSTRACT: | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON (Monitor) |
|---|---|---|---|---|---|
| Unclassified | Unclassified | Unclassified | SAR | 286 | Chris Burneka<br>**19b. TELEPHONE NUMBER** *(Include Area Code)* |

**Standard Form 298 (Rev. 8-98)**
Prescribed by ANSI Std. Z39-18

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## ACKNOWLEDGMENTS

The authors would like to thank the following people for their expertise and assistance during this study in helping to: develop and design test fixtures, install and calibrate instrumentation, set-up and run data collection systems, and process data:

- Mr. Delane "Bull" Bullman, Mr. Brian Grattan, Mr. Eric Master, Mr. Greg Thompson, Mr. Glenn Thomas (Infoscitex Corporation)

- MSgt Clifford Hatch, TSgt James Chase, TSgt Filmon Yosief (Aircrew Biodynamics and Protection Team within the 711 Human Performance Wing)

- Mr. Ben Steinhauer, Mr. Joseph Strzelecki (Aircrew Biodynamics and Protection Team within the 711 Human Performance Wing)

## 1.0 OVERVIEW

The Aircrew Biodynamics and Protection (ABP) Team of Air Force Research Laboratory (AFRL) 711th Human Performance Wing (711 HPW), Aerospace Physiology and Performance Section (RHCPT), and their in-house technical support contractor, Infoscitex, conducted an experimental effort involving a series of negative x-axis (-Gx) impact tests conducted on the Horizontal Impulse Accelerator (HIA). The purpose of the tests was to perform a comparative assessment of seat and torso mounted restraint systems during pure horizontal and off-axis horizontal impact accelerations simulating drogue chute and main chute deployment phases of ejection. Parametric assessment was conducted with several parameters that also included impact acceleration, headrest position relative to seatback tangent plane, head supported mass (helmet system), and seat back angle relative to the horizontal. Lightest Occupant in Service (LOIS) and Large Anthropometric Research Device (LARD) instrumented manikins were used in this test program to simulate human response. Data collection on the HIA consisted of manikin upper cervical spine loads and moments, manikin lumbar loads, manikin head accelerations, shoulder straps and lap belt loads, seat pan and cushion accelerations, seat pan loads, HIA sled acceleration, and high speed video.

This effort was internally funded by the United States Air Force (USAF), Air Force Research Laboratory, 711th Human Performance Wing, Airman Systems Directorate. The results provided in this report will be used as a reference for future test programs addressing parametric assessment of ejection configuration parameters using volunteer human subjects on the HIA.

## 2.0 BACKGROUND

The new Joint Strike Fighter (JSF) aircraft will employ a Martin-Baker Mk-US16E ejection seat, which is expected to accommodate the full range of aircrew (103-245 lb). However, preliminary rocket sled qualification tests of this seat have shown that the neck forces and head rotations as measured by instrumented manikins may be unacceptably high for small human occupants. In addition, recent publications have reported a higher than expected 28% injury rate for all size occupants in Royal Air Force (RAF) aircraft using Mk series seats, which has been documented from 232 mishaps through 2002. Most of the injuries occurred in the region of T4-L1 (Lewis, 2006). The Italian Air Force also documented a high spinal injury rate of 40% during 20 ejections in Mk series seats (Cangiano, 2011).

Surprisingly, the risk of spinal injury for the above qualification and operational ejections was deemed acceptable (< 5%) when estimated by the USAF Dynamic Response Index (DRI), which is the primary method used by the USAF for estimating injury risk during aircraft ejections. There is great concern in both the operational and research communities regarding this gross underestimation of spinal injury risk.

It has been surmised by Tulloch (2011) that the reason for the spinal injury rate being greater than predicted by the DRI during Mk seat ejections is due to excessive upper torso motion generated by the combination of the new seat-mounted harness, forward-mounted headrest, and the new helmet-mounted systems being employed with these seats. The DRI limits were originally developed and validated based on seats using a standard torso-mounted harness, in-line headrest, a seatback angle relative to the catapult thrust line of 5° or less, and a standard flight helmet (Brinkley & Shaffer, 1971). These seat configuration limitations do not fully account for the cases where the seating/restraint system configuration may allow for increased upper-torso motion during ejection (Buhrman, 2012).

There are currently no data sets that allow the estimation or modeling of head accelerations and neck loads experienced by humans wearing the new seat-mounted restraint system in combination with a forward headrest and new integrated helmet systems. The experimental effort focusing on parametric assessment of ejection configurations can now allow for analysis of the differences in accelerations and displacements due to the new seat and restraint parameters, and then determine their influence on risk of injury during different phases of ejection from the new F-35 and other high performance aircraft. The results will be used to ascertain whether a lowering of the Dynamic Response Index or DRI (currently at a value of 18) should be adopted for new seats such as the Mk-US16E, in order to maintain the 5% injury threshold which is normally required by the USAF for ejection injury risk. The Dynamic Response Index (DRI) was introduced over 50 years ago to study the correlation of spinal injuries to impact accelerations applied along the spine during seat ejections in fixed wing aircraft. The DRI is representative of the maximum dynamic compression of the spinal column and is calculated by using the equation of motion of an analogous single degree of freedom mass-spring-damper model. Given a vertically applied acceleration-time profile as an input to the model, the model predicts the compressive response of the spinal column with the DRI assessing injury potential.

The experimental results will also be used to update current neck injury criteria, and develop new lumbar spine injury criteria based on compressive loading in the lumbar spine combined with a forward flexion or moment about y-Axis (My) torque measured in the lumbar spine.  This new criteria will be similar to the Nij neck injury criteria developed by National Highway Traffic and Safety Administration (NHTSA).

## 3.0 OBJECTIVES

The primary purpose of this effort was to investigate the effects of current and new ejection seat parameters on crewmembers under simulated ejection conditions based on instrumented manikin tests. The data collected during this test program enabled us to evaluate the potential for injury risk to crewmembers due to new seat geometries, restraint systems, and helmet systems during high-speed ejections. The data will also be used as a prediction of expected human test subject responses in a follow-up test program following the completion of the manikin testing.

The critical issues questions this test program answers include:

a. Does the positioning of the headrest affect the acceleration and motion of the head and torso during pure horizontal impact acceleration?
b. Do new helmet systems contribute to greater accelerations and displacements of the head and torso as compared to standard helmets and current helmet systems during pure horizontal impact acceleration?
c. Do new seat-mounted harnesses contribute to greater acceleration and motion of the head and torso as compared to traditional torso-mounted harnesses during pure horizontal impact acceleration?
d. Does the positioning of the headrest affect the acceleration and motion of the head and torso during off-axis horizontal impact acceleration?
e. Do new helmet systems contribute to greater accelerations and displacements of the head and torso as compared to standard helmets and current helmet systems during off-axis horizontal impact acceleration?
f. Do new seat-mounted harnesses contribute to greater acceleration and motion of the head and torso as compared to traditional torso-mounted harnesses during off-axis horizontal impact acceleration?

## 4.0 TEST FACILITY AND EQUIPMENT

### 4.1 Horizontal Impulse Accelerator

The Horizontal Impulse Accelerator or HIA (Shaffer, 1976; Strzelecki, 2006) was used to conduct the –Gx impact tests to evaluate acceleration response, neck and spine loading and restraint system loading during the horizontal acceleration experienced during simulated parachute opening shock or seat/man separation phase of an ejection. The HIA consists of a thrust pistion, a test sled, and track rails. The 4x8 ft sled is positioned on 160 feet of twin-rail track and the sled is accelerated from a stationary position by the thrust piston housed in a pneumatic actuator. The HIA actuator operates on the principle of differential gas pressures acting on both surfaces of the thrust piston in the actuator (24 inch diameter cylinder). The impact acceleration occurs at the beginning of the experiment as stored high-pressure air is allowed to impinge on the back-side surface of the thrust piston inside the 24 inch cylinder. The thrust piston is held in place inside the cylinder by a lock-yoke. At t=0 sec following a count-down, the lock-yoke is released causing the high-pressure air to move the thrust piston and accelerate the sled down the track. As the sled breaks contact with the thrust piston, the sled coasts to a stop or is stopped with a pneumatic brake system mounted beneath the sled. The acceleration pulse imparted to the sled depends on the pressure differential within the actuator (set pressure and load pressure), the volumes of the pressure chambers within the actuator (set length and load length), and the shape of the metering pin (HIA metering Pin #10 was used for this effort). It is also possible to increase the onset rate of the acceleration pulse by applying glide brakes from the start of impact. The HIA is shown in Figure 1.

**Figure 1. 711 HPW Horizontal Impulse Accelerator Facility**

## 4.2 HIA Configuration

A specially-designed generic seat, composed of a flat seat-pan perpendicular to a flat seat-back, was used to restrain the manikin. The generic impact seat was rigidly mounted onto a multi-axial test buck attached to the top of the HIA sled. The test buck allows any seat to be positioned at multiple angles in both yaw (0° to 180°) and pitch (0° to 90°) relative to the thrust piston at the front of the sled. The generic seat for this program was positioned either in an upright, seated position (0° yaw and 0° pitch) shown in Figure 2, or in a reclined position (0° yaw and 45° pitch rearward) shown in Figure 3.

A flat head rest plate was also positioned above the seat back plate. The front vertical plane of the headrest was able to be positioned from 0 to 3 inches forward of the vertical plane of the seat back. The seat fixture was designed to allow instrumentation with load cells and accelerometers to collect dynamic response data during the impact. The primary modification to the seat fixture for this series of tests was the positioning of the headrest either at 0” in front of the plane of the seat back (in-line), or at 2.5” in front of the plane of the seat back.

The positive axis of the coordinate system for the test configuration for this program is defined with respect to the plane of the seatback of the seat fixture mounted on test buck on the top of the HIA sled. Therefore, the coordinate system moves with respect to the test buck/test seat as the seat is positioned in yaw or pitch. The coordinate system is shown for this test series in Figure 4.

**Figure 2. Generic Seat Fixture Mounted in Upright Postion on HIA Sled**

**Figure 3.  Generic Seat Fixture Mounted in Reclined Position on HIA Sled**


**Figure 4.  Coordinate System Used for Generic Seat Fixture on HIA Sled**

## 4.3 Manikins

All tests were conducted with an instrumented manikin. A LOIS, instrumented manikin, nude weight of approximately 103 lb, and a LARD, instrumented manikin, nude weight of approximately 245 lb, were both utilized in this test program. Each manikin was dressed in appropriately sized flight gear and helmet system defined below. Hybrid III 50th male Aerospace and Hybrid III 50th male Automotive manikins were also subjected to a limited number of impacts primarily for development of computational models, and the data from those manikins will not be discussed in this report.

## 4.4 Restraints and Related Flight Equipment

The test manikins were restrained with either the standard USAF torso harness configuration or the Simplified Combined Harness (SCH) which interfaces with the seat. The harness configuration is part of the parametric assessment and will be highlighted in the Experimental Design.

The USAF harness configuration is composed of parachute riser straps and the Advanced Concept Ejection Seat (ACES) II lap belt configuration that interfaces with either the Protective Combat Uniform (PCU)-15/P or PCU-16/P torso harness depending on the subject size. The PCU harness configurations were fitted to each manikin prior to positioning in the seat. Once positioned, the lap belts were adjusted first, and attached to load cells mounted on each side of the seat pan and tightened securely with pre-tension levels of 20 ± 5 lb at each attachment point. The parachute riser straps are routed over each shoulder and secured to the load cells which were mounted just behind the seat back. The parachute riser straps were adjusted after the lap belts, and tightened securely with pre-tension levels of 20 ± 5 lb at each attachment point. The PCU torso harness on a LARD manikin is shown in Figure 5.

The SCH is integrated into the cushions of the Mk16 series seats, therefore both the restraint and the seat back and seat pan cushion from the Mk16 seat were integrated into the generic seat fixture on the HIA. The SCH also had its parachute riser straps routed over each shoulder and secured to load cells behind the seat back. The set-up procedures were based on instruction from an on-site Martin-Baker representative in conjunction with the US16E Ejection Seat Aircrew Manual (Martin-Baker, 2013), within the limitations of using manikin subjects and laboratory test facilities. Harness straps were employed in place of an operational seat’s inertial reel straps and were affixed/terminated at rigidly mounted load cells aft of the seat back. The seat pan was adjusted such that these harness straps were parallel to the horizontal, and the manikin’s helmet was approximately centered in the headrest. The crotch straps were pulled up to remove excess slack. The test operator and tower technicians then routed the shoulder straps and lap belts through the belt loops, and locked the ends into the Quick Release Box (QRB). The technicians placed their fingers between the two lap belt straps and pulled to remove excess slack. The test operator tightened the lap belt securely with pre-tension levels of 40 ± 5 lb measured at each attachment point. The technicians grabbed the shoulder buckles and leaned the manikin forward to remove slack in the harness behind the seat back cushion. Then the technicians pushed the manikin back into the seat while pulling down on both shoulder strap adjusters. The test operator pushed to remove any excess slack in the rear of harness and checked to make sure that

the upper rear cross strap was firmly in place up against the Life Preserver Unit. The test operator then pulled the straps to obtain 20 ± 5 lb of tension as measured on each shoulder strap. The SCH on a LARD manikin is shown in Figure 6.

The manikins were dressed in a standard USAF flight suit, and then fitted with either Head Gear Unit (HGU)-55/P and Mask Breathing Unit (MBU)-20/P oxygen mask helmet configuration, or the JSF Gen-II mock-up and MBU-20/P oxygen mask helmet configuration. The Gen II mock-up helmet weighed approximately 5 lb. with mask, and the HGU-55/P helmet weighed approximately 3 lb. with mask. The Gen II mock-up helmet had a forward center-of-gravity (CG) shift in the head anatomical x-axis of approximately 1.05 inch forward, and z-axis shift of 1.45 inch upward as measured with a Large ADAM manikin headform.

Following test 8800, cargo straps were placed around the ankles of the manikins for each test to prevent full extension of the lower leg and limit damage to the manikin's knee joints. The straps were adjusted to allow a maximum forward rotation of the lower leg relative to the knee of approximately 30° or less, and are highlighted in Figure 7.

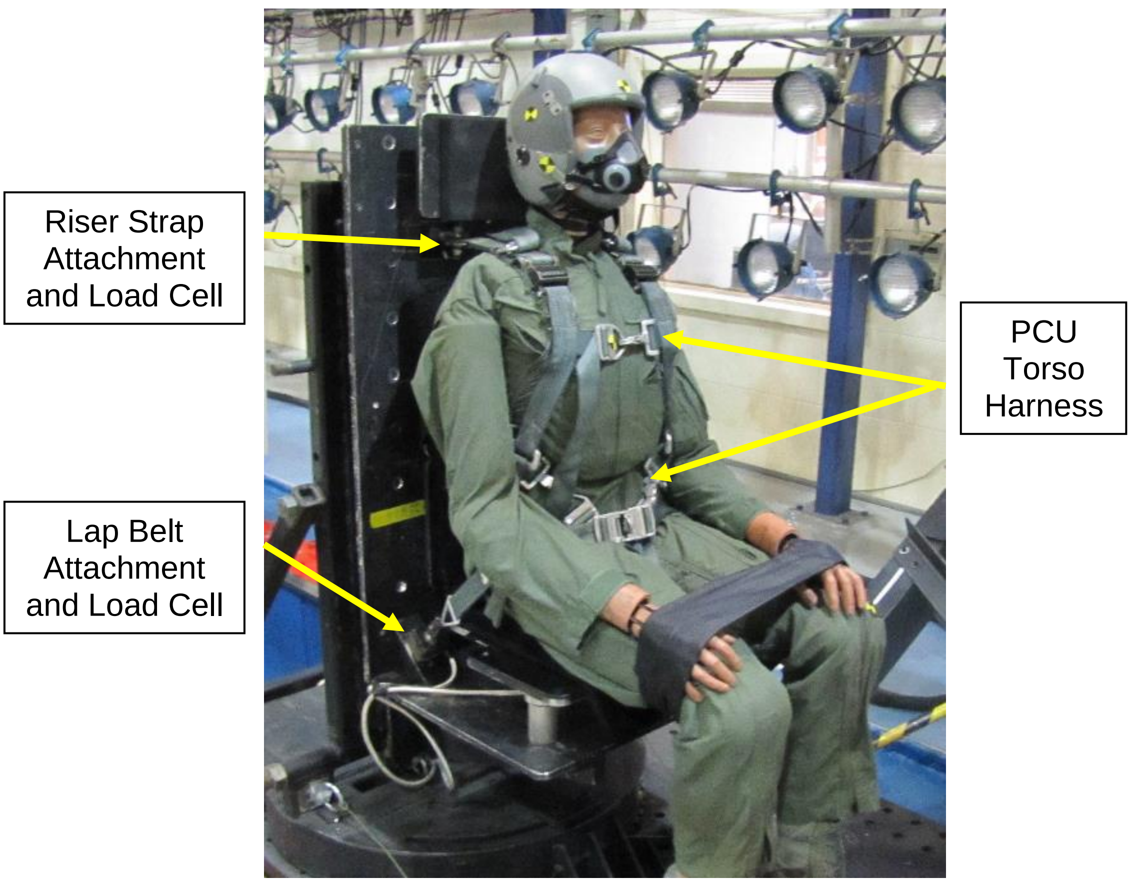


**Figure 5. PCU Torso Haness on the LARD Manikin on HIA Sled**

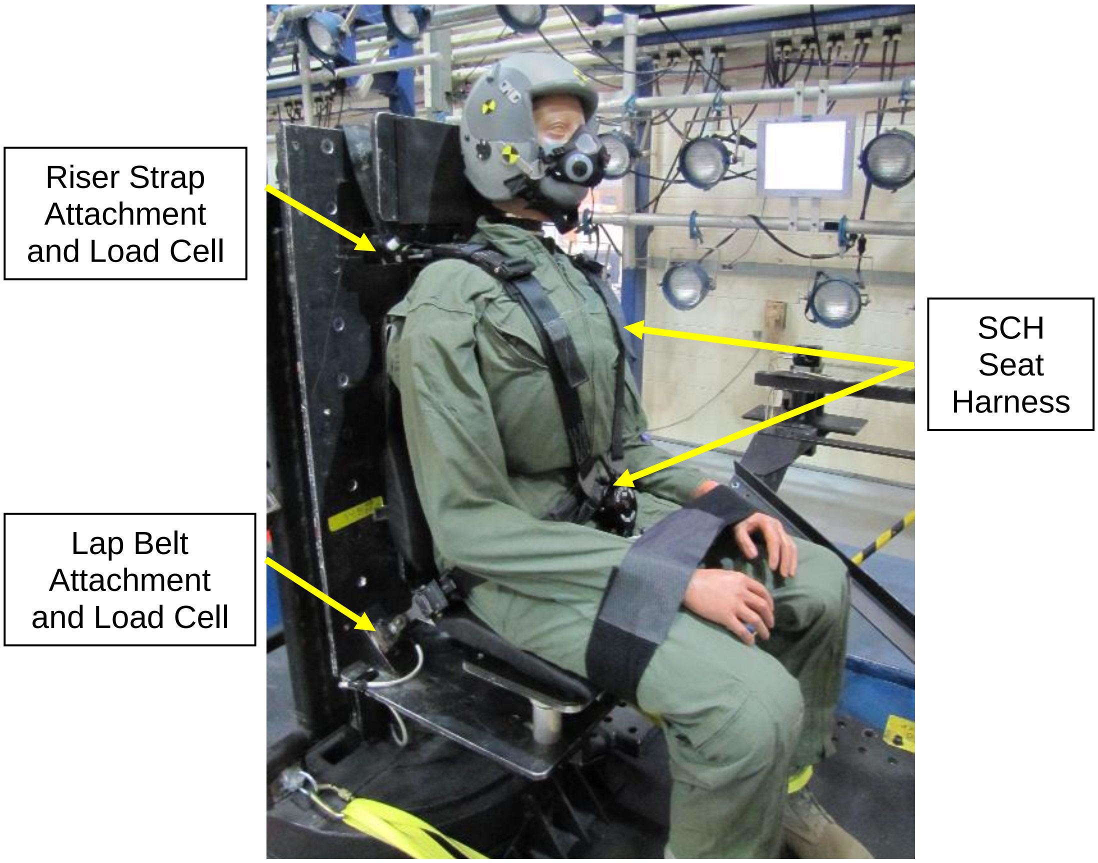


**Figure 6. SCH Seat-Mounted Haness on the LARD Manikin on HIA Sled**

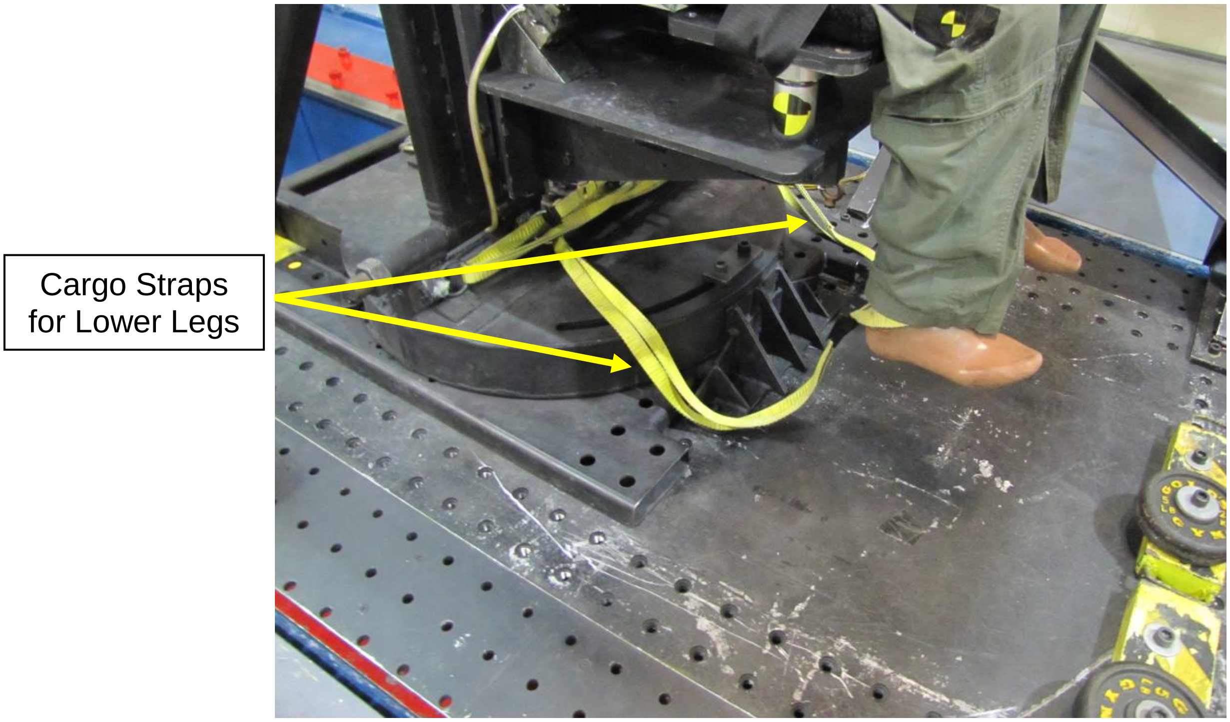


**Figure 7. Cargo Straps used to Restrain Lower Manikin Legs During HIA Impact Tests**

## 5.0 INSTRUMENTATION AND DATA COLLECTION

Transducers were chosen to provide the optimum resolution over the expected test acceleration ranges. Full-scale data ranges were selected to provide the expected full-scale range plus 50% to assure the capture of peak signals. All transducer bridges were balanced for optimum output prior to the start of the program. The appropriate accelerometers were adjusted with software for the effect of gravity by adding the component of a 1 G vector in-line with the force of gravity along the accelerometer axis (z-axis or combined z-axis/x-axis depending on seat back angle).

This research effort used the Right-Hand Rule coordinate system (shown in Figure 4) with the z-axis parallel to the seat back and with positive being up towards the HIA overhead light fixtures. The x-axis is perpendicular to the z-axis and points outward away from the seat fixture. The y-axis is perpendicular to the x- and z-axes according to the right-hand rule. The linear accelerometers were wired to provide a positive output voltage when the acceleration experienced by the accelerometer was applied in the +x, +y and +z directions.

The manikin coordinate system used was an inverted Society of Automotive Engineers (SAE) J211 system (The moments were reverse from the SAE J211 system). Flexion (head rotation forward) was measured as positive, and extension (head rotation rearward) was measured as negative. Compression on the neck load cell and the lumbar load cell was negative, and tension was positive.

### 5.1 Facility Instrumentation

Acceleration measurements were taken on the HIA at different reference point locations on the sled and the seat structure. Load cells were also mounted on each seat structure to record reaction loads of the manikin restraint harness at the termination points for the shoulder straps and the lap belt straps. The specific instrumentation for this test series are detailed below.

The HIA sled was instrumented with a tri-axial linear accelerometer package mounted on the bottom of the sled deck. The sled x-axis acceleration was measured with either an Endevco Model 7264-200 or an Endevco Model 2262A-200 accelerometer. The sled y-axis acceleration was measured with either Entran Model EGE-72-200 or an Endevco Model 7264-200 accelerometer. The z-axis acceleration was measured with an Entran EGE-72-200 accelerometer. A tri-axial accelerometer package was also mounted on the seat pan close to the seat reference point, and consisted of three Entran Model EGV3-F-250 accelerometers.

The restraint configurations were instrumented with specially designed tri-axial load cells at the lap belt and shoulder/riser belt termination points. The left lap belt force was measured with a Michigan Scientific Model 3000 load cell. The right lap belt force was measured with either a Michigan Scientific Model 3000 or Model 4000 load cell. The left shoulder/riser strap force was measured with either a Michigan Scientific Model 3000 or Model 4000 load cell. The right shoulder/riser strap force was measured with a Michigan Scientific Model 3000 load cell. These locations are shown in Figures 5 and 6.

## 5.2 Manikin Instrumentation

The manikins were instrumented with tri-axial accelerometer packages located in the head, chest, and pelvis, and with 6-axis (3 orthogonal linear forces, 3 orthogonal moments) load cells in the upper neck and the lumbar spine/pelvis junction. The critical accelerations for this effort were the head z acceleration, head x acceleration, and the head angular acceeleration (Ry). The critical bending moment for this effort was the bending moment that measured flexion and extension of the head on the neck (My) during impact.

The manikin heads were instrumented with a tri-axial linear accelerometer package and a single angular accelerometer measuring rotational acceleration around the head y-axis (flexion/extension motion of the head). The tri-axial accelerometer package was composed of either three Entran Model EGV3-F-250 linear accelerometers or three MEAS SPEC Model EGCS-S425-250 linear accelerometers. A single Endevco Model 7302B angular accelerometer was mounted next to the tri-axial package to record the head angular acceleration around the y-axis.

The chest and lumbar/pelvis junction of each manikin were instrumented internally with a tri-axial accelerometer packages composed of linear accelerometers. The chest tri-axial package was composed of either three Entran Model EGV3-F-250 linear accelerometers or three MEAS SPEC Model EGCS-S425-250 linear accelerometers. Some horizontal sled tests also included a single Endevco Model 7302B angular accelerometer in the chest package to record chest angular acceleration around the y-axis of the torso. The lumbar tri-axial package was composed of either three Entran Model EGV3-F-250 linear accelerometers, or a mixed package of three linear accelerometers that consisted of Entran Model EGV3-F-250 and MEAS SPEC Model EGCS-S425-250 units.

The upper neck of each manikin was instrumented with a Denton Model 1716A 6-axis load cell which measured the axial loads and angular torques in the three orthogonal axes. The lumbar spine of each manikin was instrumented with a Denton Model 1914A 6-axis load cell.

## 5.3 Transducer Calibration

On-site personnel from Infoscitex, Inc., conducted pre- and post-calibrations on all sensors used on the carriage and seat fixture. Calibration records of individual transducers as well as the Standard Practice Instructions are maintained in the biodynamic facility's Impact Information Center. For this test program, a record was made identifying the data channel, transducer manufacturer, model number, serial number, date and sensitivity of pre-calibration, date and sensitivity of post-calibration, and percentage change. Pre- and post-calibration information is maintained with the program data. The instrumentation used in this study is listed in the Electronic Instrumentation Data Sheets (See Appendix A).

## 5.4 Data Acquisition Control

The Master Instrumentation Control Unit in the Instrumentation Room located between the HIA and the Vertical Deceleration Tower (VDT) impact facilities controlled the data acquisition. A test was initiated when the countdown clock reached zero using a comparator. The comparator was set to start data collection at a pre-selected time based on a positive reading of multiple safety inter-lock sensors used by the facility to protect the facility operators and for when human test subjects were used. Data were recorded to establish a zero reference for all transducers prior to restraining the manikin to the seat fixture. The reference data were stored separately from the test data and were used in the processing of the test data. A reference mark pulse was generated to mark the electronic data at a pre-selected time after test initiation to place the reference mark close to the impact point. The reference mark time was used as the start time for data processing of the electronic data.

## 5.5 Data Acquisition System

This research program used the Test Data Analysis System (TDAS) PRO manufactured by Diversified Technical Systems (DTS), Inc., to collect all the facility, seat fixture and manikin data for each test as defined by the test matrix. The 64 channel TDAS PRO was mounted on-board the HIA at the back of the sled (Figure 8). The TDAS PRO is a ruggedized, DC powered, fully programmable signal conditioning and recording systems for transducers and events. The TDAS PRO was designed to withstand a 100 G shock.

The signal conditioning accepts a variety of transducers including full and partial bridges, voltage, and piezo-resistive sensors. Transducer signals are amplified, filtered, digitized and recorded in onboard solid-state memory. The data acquisition system is controlled through an Ethernet interface using the Ethernet instruction language. A desktop Personal Computer (PC) with an Ethernet board configures the TDAS PRO before testing and retrieves the data after each test. For this program, the Data Acquisition System (DAS) collected data at a 1K sample rate with a 120 Hz anti-aliasing filter.

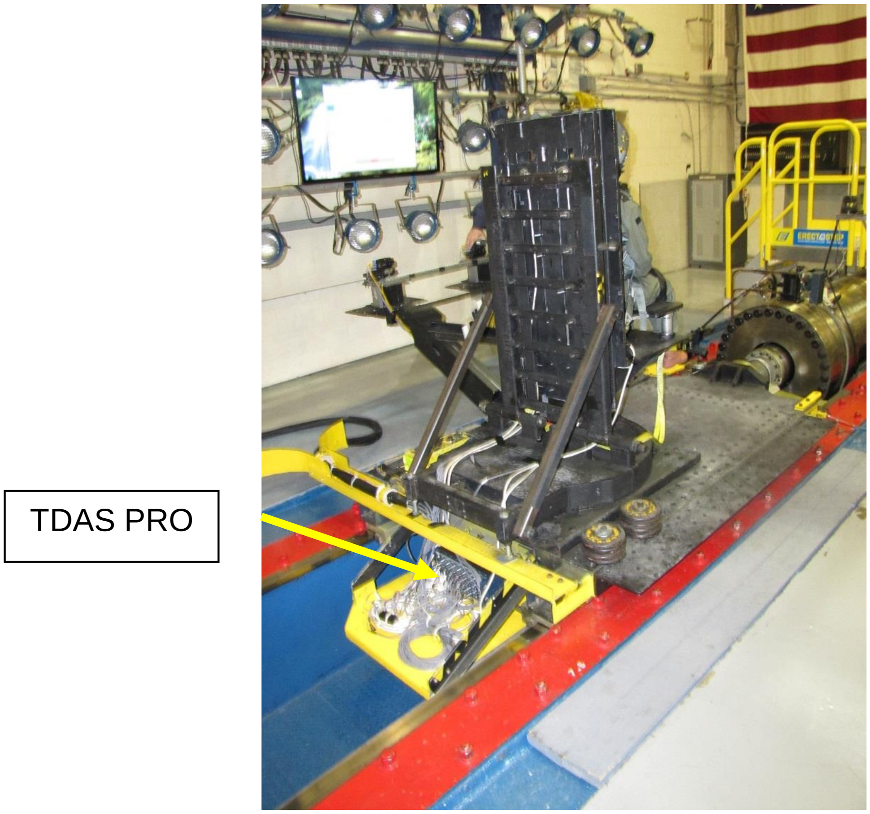


**Figure 8. Location of TDAS PRO Data Collection System Mounted on HIA Sled**

### 5.6 Quick Look Data Plots

After each test, the filtered data were graphically plotted in a portrait format of 4-6 plots per page, and grouped with similar channels. The spreadsheet of plots also contained pertinent maxima, minima, and respective times of each occurrence. For all data, time = 0 was at initial carriage motion. The plots arranged in this fashion included: displacement versus time, force (load) versus time, and acceleration versus time.

### 5.7 High Speed Video and Photography

Two Phantom Miro-3 High-Speed digital cameras (Figure 9) were used to collect video of each test. The cameras were mounted on-board the HIA sled at perpendicular and oblique angles relative to the seat fixture and test manikin as shown in Figure 10.

The Phantom Micro line is a compact, light-weight, rugged family of cameras targeted at industrial applications ranging from biometric research to automotive crash testing. Rated to survive 100g acceleration this rugged camera can take 512x512 images at up to 2200 frames-per-second (fps). Reduce the resolution to 32 x 32 and achieve frame rates greater than 95,000 fps. With an ISO rating of 4800 (monochrome, saturation-based ISO 12232), the camera has the light

sensitivity for the most demanding applications. With shutter speeds as low as 2 microseconds, the user can freeze objects in motion, eliminate blur, and bring out the image detail needed for successful motion analysis. The camera accepts any standard 1" C-mount lens. The Phantom Miro-3 member of the family is optimized for applications such as Hydraulically Controlled, Gas Energized (HYGE) crash simulations used in the automotive industry. Selectable 8-, 10- or 12-bit pixel depth allows the user to choose the dynamic range that best meets the demands of the application. The Miro-3 has a number of external control signals allowing for external triggering, camera synchronization, and time-stamping. The camera has both dynamic RAM and internal flash memory for non-volatile storage. Internal battery power allows the camera to be used in an un-tethered mode and ensures data survivability in case of loss of power.

The images for this study were collected at 500 fps. The video files were downloaded and converted to MP4 format, and stored in the Airman Systems Directorate (RH) Collaborative Biomechanics Data Bank. Photographs were taken of the test set-up prior to each test. Photographic and video data were stored on an internal network for downloads as requested.

**Figure 9. Phantom Miro-3 High-Speed Digital Camera**

**Figure 10.  Phantom Miro-3 Cameras Mounted On-Board HIA Sled**

## 6.0 EXPERIMENTAL DESIGN

### 6.1 Horizontal Impact Testing

The test matrix was developed to address the program requirement to conduct a parametric assessment of manikin response based on variable restraint system, head rest position, seat back position, and helmet system. The HIA generated an acceleration waveform that approximated a half-sine waveform with a peak acceleration that varied from 6 to 15 G, a velocity change that varied from 25 to 31 ft/s, and a time-to-peak acceleration that varied from 34 ms to 57 ms.

The test cell designation for this program consisted of a Cell Identification or Cell ID indicated by a capital letter, and the peak G-level for that Cell ID indicated by a number. The test matrix, shown in Table 1, was modified during the program due to preliminary assessment of some of the data, and other unforeseen circumstances; therefore, the data analysis contained in this report will focus on Cell's M, N, O, P, Q, S, T, U, V, and W. Cell R was not run due to the unavailability of the Neck Protection Device (NPD). Cells MN and ON (no seat cushion), and Cells X and Y (no helmet) were not analyzed for this report as that data was collected specifically for computational model development. These cells are grayed-out in the test matrix. Each size manikin ran once under each test condition with the exception of the 10G cells which called for 3 tests per manikin to assess repeatability.

Two separate baseline conditions were defined based on the position of the seat back. The first baseline configuration was defined as Cell M (in-line headrest, vertical seat back, standard helmet, and a torso harness), and data from the other cells with the vertical seat back were compared to this baseline configuration. This was subsequently defined as the Baseline One Parametric Analysis and included data from Cells M, N, O, P, and Q. A second baseline configuration was defined as Cell S (in-line headrest, standard helmet, and a torso harness) with the seat back in a - 45° reclined position, and data from other cells with the reclined seat back position were compared to this second baseline configuration. This was subsequently defined as the Baseline Two Parametric Analysis, and included data from Cells S, T, U, V, and W. An additional comparison was also made between the two separate baseline conditions (Cell M and Cell S), and this data comparison is included under the Baseline One Parametric Analysis.

**Table 1. HIA Impact Test Matrix**

| Test Cell | Restraint Harness Configuration | Headrest Position | Seatback Position | Helmet/Mask Configuration | Seat Cushion |
|---|---|---|---|---|---|
| M6, M8, M10, M12, M15 | PCU | 0” | 0° | HGU-55/P | ACES II |
| MN6, MN8, MN10, MN12, N15 | PCU | 0” | 0° | HGU-55/P | NONE |
| N6, N8, N10, N12, N15 | PCU | 2.5” | 0° | HGU-55/P | ACES II |
| O6, O8, O10, O12, O15 | PCU | 0” | 0° | JSF GenII | ACES II |
| ON6, ON8, ON10, ON12, ON15 | PCU | 0” | 0° | JSF GenII | NONE |
| P6, P8, P10, P12, P15 | SCH | 0” | 0° | HGU-55/P | MB |
| Q6, Q8, Q10, Q12, Q15 | SCH | 2.5” | 0° | JSF GenII | MB |
| R6, R8, R10, R12, R15 | SCH | 2.5° w/NPD | 0° | JSF GenII | MB |
| S6, S8, S10, S12, S15 | PCU | 0” | 45° | HGU-55/P | ACES II |
| T6, T8, T10, T12, T15 | PCU | 2.5” | 45° | HGU-55/P | ACES II |
| U6, U8, U10, U12, U15 | SCH | 0” | 45° | HGU-55/P | MB |
| V6, V8, V10, V12, V15 | SCH | 2.5” | 45° | HGU-55/P | MB |
| W6, W8, W10, W12, W15 | SCH | 2.5” | 45° | JSF Gen II | MB |
| X6, X8, X10, X12, X15 | PCU | 0” | 0° | NONE | ACES II |
| Y6, Y8, Y10, Y12, Y15 | PCU | 2.5” | 0° | NONE | ACES II |

## 6.2 Risk Assessment Methodology

An initial assessment of head accelerations, neck loads & moments, lumbar loads and moments, and mask and helmet system interaction were conducted at the conclusion of each test. Analysis of the effect of head accelerations, neck and lumbar loads and moments, and restraint harness effects on body injury risk was conducted at the end of the test program.

An analysis of potential neck injury due to imparted loads and torques during the impact acceleration was conducted using a neck injury risk assessment tool known as the AFRL Neck Injury Criteria. The combined cervical force and neck moment limits are expressed as the AFRL Nij, also known as the Multi-Axial Neck Injury Criteria (MANIC) for x-axis and z-axis impacts or MANICx which is based on the work of Parr (2014). The AFRL Nij or MANICx is calculated using specific measured loads and moments from the special six-axis load cell (3 orthogonal axial loads, and 3 orthogonal rotational moments) mounted in the neck of the LOIS and LARD manikins. Axial tension and compression loads are measured in the z-axis of the neck (inferior/superior direction). Flexion and extension moments of the neck are measured about the y-axis of the head/neck junction (flexion is forward motion of the head towards the chest, extension is rearward rotation of the head towards the back or shoulder blades). The y-axis of the head runs from right ear canal to the left ear canal with positive towards the left.

The combined cervical-force-and-moment Nij value was calculated for each test on the HIA. The peak AFRL Nij limit for risk of injury in aerospace applications is 0.56 (Parr et al, 2013) for an Abbreviated Injury Scale (AIS) 2 injury at a probability level less than or equal to 5%. The Nij value was calculated and the probability of an AIS 2 injury could be calculated using the following formulas:

$$\text{Nij (MANICx)} = (F / F_{int}) + (M / M_{int}) \tag{1}$$

$$P(AIS \geq 2) = \frac{1}{1 + e^{5.2545 - 4.1 * MANIC_X}} \tag{2}$$

where:

F is the measured manikin axial neck tension/compression load in pounds (lb)
$F_{int}$ is the critical intercept load
M is the measured manikin flexion/extension bending moment in inch-pounds (in-lb)
$M_{int}$ is the critical intercept moment

The Nij criteria do not apply to loading in pure tension or compression. Nij values are computed for each of the following combined neck loading cases:

$N_{te}$ = Tension with Extension
$N_{tf}$ = Tension with Flexion
$N_{ce}$ = Compression with Extension
$N_{cf}$ = Compression with Flexion

In conditions where the Nij/MANICx cannot be calculated or evaluated, the maximum neck tension measured during the tests shall also be evaluated to determine neck injury potential. The maximum neck tension, as measured at the occipital condyles (C0 – C1), will not exceed the values shown in Table 2, and which equate to a probability of injury less than or equal to 5% for the aircrew size ranges shown. The value for the Mid-Male was calculated using the following equation where P is the probability, and MANICz is the neck tension in Newtons (N):

$$P(AIS \geq 2) = \frac{1}{1 + e^{7.254 - 0.00328 * MANICz(N)}} \tag{3}$$

**Table 2. Neck Tension Limits**

| 5th % Small Female (103 lb) | 50th % Mid Male (172 lb) | 95th % Large Male (245 lb) |
|---|---|---|
| 186 lb<br>(828 N) | 295 lb<br>(1313 N) | 357 lb<br>(1587 N) |

The values in Table 2 for the Small Female and Large Male occupants were calculated using the ratios of the NHTSA specified Mid-Male critical intercept value defined in table 6-1 of the neck injury document (Eppinger, 1999) and the value generated by Parr for the Mid-Male tension value (Parr, 2014). The ratio of those values was then utilized to calculate the scaled Small Female and Large Male values based on the Large Male value and Small Female value listed in the NHTSA critical intercept tension chart for the respective occupant sizes. The limits defined here were calculated using the same scaling approach utilized by NHTSA for the neck tension critical intercept values used in the Nij calculations. This scaling approach was then used to estimate a Probability of Injury Curve for both the LOIS and the LARD manikin, and are shown below in equations 4 and 5 for LOIS and LARD respectively.

$$P(AIS \geq 2) = \frac{1}{1 + e^{7.259 - 0.00523 * MANICz(N)}} \tag{4}$$

$$P(AIS \geq 2) = \frac{1}{1 + e^{7.258 - 0.00271 * MANICz(N)}} \tag{5}$$

An analysis of potential lumbar spine injury during the simulated ejection was conducted using the compressive lumbar load limits as defined in the AFRL Ejection Injury Criteria document. The lumbar load limits are specified below in Table 3.

**Table 3. Manikin Lumbar Load Limits**

| | **5th % Small Female (103 lb)** | **50th % Mid Male (172 lb)** | **95th % Large Male (245 lb)** |
|---|---|---|---|
| **Lumbar Load Limit** | 933 lb | 1395 lb | 1757 lb |
| ***(reduced 30%)*** | *(653 lb)* | *(977 lb)* | *(1230 lb)* |

In addition, the forward flexion or positive My torque measured in the lumbar spine was also evlauated due to its influence on the compressive load limit. For instance, it has been shown that when forward flexion of the torso is $\geq$15 degrees forward as measured from the frontal plane of the pelvis or from the angle at the base of the spine, the established lumbar load limits should be reduced by 30% from the values listed for each respective aircrew size (Yoganandan et al, 1988). The positive My torque measurement is an indication of forward flexion of the torso.

### 6.3 Test Procedures

The following test procedures were used for all the manikin tests on the HIA.

a. Zeros were taken for channel calibration prior to each test.

b. After the manikin was properly dressed and configured with the correct mask, helmet, and restraint configuration, mechanical checks were performed, the manikin was placed in the generic seat mounted on the sled. The lap belt and shoulder harness were attached and preloaded as previouly described.

c. The manikin's hands were placed in its lap and secured with Velcro straps (or similarly restrained) along with the manikin's ankles. The upper arms were parallel to the seat back.

d. Final checks were conducted to ensure that proper restraint fit and positioning were completed.

e. Still photographs were taken from the side and frontal views.

f. The test area around the HIA was evacuated and the Safety Officer checked all safety systems and assured that the test area is secured and ready for facility operation.

g. The load chamber of the HIA cylinder was then pressured to a pre-determined pressure level to provide the proper impact level.

h. If all safety systems continued to be satisfactory, the Test Conductor instructed the HIA operator to start the automatic countdown and activate the release of the HIA thrust column at t = 0, and propelling the sled down the track.

i.  After the sled came to a stop, pictures were taken of the seat and manikin, and then the sled was pulled back to the starting position (a stationary position that is in-contact with the front of the thrust column).

j.  The manikin was then removed from the seat, and the seat, restraint system, and all other flight equipment were inspected prior to the next test.

## 7.0 RESULTS

One hundred and ninty impact tests were completed in support of this effort to characterize the biodynamic response of the LOIS and LARD manikins to impact acceleration pulses generated by the HIA. Tests conducted in Test Cells M, N, O, P, Q, S, T, U, and W, as defined in Table 1, were analyzed to assess the effects of the defined parameters. The data analysis was completed using a comparative assessment with Test Cell M representing the baseline condition with the seat back in the upright (pure vertical) orientation, and Cell S representing the baseline condition with the seat back angle reclinded 45°. Data from the remaining test cells were then compared to the baseline conditions with similar seat back orientation.

Baseline I comparisons for the configuration with the seat back in the upright orientation were:

- Cell M vs Cell N (headrest variation)
- Cell M vs Cell O (helmet variation)
- Cell M vs Cell P (harness variation)
- Cell M vs Cell Q (operational configuration variation)
- Cell M vs Cell S. (seat back variation)

Baseline II comparisons for the seat configuration with the seat back in the reclined orientation were:

- Cell S vs Cell T (headrest variation)
- Cell S vs Cell U (harness variation)
- Cell S vs Cell W (operational configuration variation)

Tests conducted at the 10 G impact level per Test Cell were the only impact level condition to have multiple tests completed to assess repeatability. The repeatability of the HIA impacts is shown below in Table 4. These peak acceleration level and velocity change summaries indicate that the HIA facility and impact environment was well controlled during the duration of the program.

Table 4. HIA Sled Repeatability at 10G

| Test Cell | Manikin Type | Peak Carriage Acceleration (G) | Time-to-Peak Acceleration (ms) | Velocity Change (ft/s) |
|---|---|---|---|---|
| M10 | LARD | 10.06 ± 0.05 | 52.67 ± 0.58 | 29.68 ± 0.14 |
| | LOIS | 10.08 ± 0.08 | 44.33 ± 0.58 | 31.08 ± 0.17 |
| N10 | LARD | 9.93 ± 0.04 | 52.00 ± 0.00 | 29.73 ± 0.14 |
| | LOIS | 10.08 ± 0.02 | 44.00 ± 0.00 | 30.96 ± 0.07 |
| O10 | LARD | 10.11 ± 0.07 | 53.33 ± 0.58 | 29.42 ± 0.14 |
| | LOIS | 9.96 ± 0.08 | 53.00 ± 1.00 | 30.14 ± 0.05 |
| P10 | LARD | 10.00 ± 0.19 | 50.67 ± 0.58 | 30.19 ± 0.38 |
| | LOIS | 9.98 ± 0.08 | 51.00 ± 1.00 | 30.78 ± 0.18 |
| Q10 | LARD | 9.93 ± 0.12 | 46.33 ± 4.04 | 29.84 ± 0.15 |
| | LOIS | 10.03 ± 0.09 | 51.00 ± 0.00 | 30.74 ± 0.24 |
| S10 | LARD | 9.93 ± 0.09 | 42.33 ± 0.58 | 29.42 ± 0.14 |
| | LOIS | 9.98 ± 0.10 | 49.67 ± 0.58 | 30.52 ± 0.29 |
| T10 | LARD | 10.08 ± 0.07 | 50.00 ± 6.08 | 30.05 ± 0.11 |
| | LOIS | 9.94 ± 0.13 | 42.33 ± 5.77 | 30.58 ± 0.41 |
| U10 | LARD | 10.00 ± 0.06 | 38.67 ± 1.15 | 29.96 ± 0.10 |
| | LOIS | 10.07 ± 0.06 | 49.67 ± 0.58 | 30.70 ± 0.09 |
| V10 | LARD | 10.00 ± 0.12 | 38.67 ± 0.58 | 30.15 ± 0.26 |
| | LOIS | 10.05 ± 0.09 | 49.67 ± 0.58 | 30.82 ± 0.17 |
| W10 | LARD | 10.03 ± 0.02 | 48.00 ± 0.00 | 30.11 ± 0.05 |
| | LOIS | 10.09 ± 0.04 | 49.00 ± 0.00 | 30.94 ± 0.30 |

## 7.1 HIA Impact Response: Test-by-Test Summary

A review of the specific test configuration for each of the impact tests conducted on the HIA with the LOIS and LARD manikins is documented with a test-by-test summary of the test conditions and a brief summary of the key data. The test-by-test summary is shown in Appendix B.

## 7.2 Baseline I HIA Parametric Assessment: Vertical Baseline Seat

Baseline I comparative assessment was conducted with Test Cell M representing the baseline condition with the seat back in the upright (pure vertical) orientation, headrest in-line with the seat back, standard HGU-55/P helmet, and the standard 15/P torso harness. Comparisons were conducted based on headrest position, helmet weight, harness configuration, simulated ejection seat configuration, and seat tilt position.

### 7.2.1. Headrest Position

A comparative assessment of the data from Test Cell M and Test Cell N evaluated the effects of positioning the headrest forward 2. 5” from the baseline configuration defined as the headrest inline with the seat back or 0” forward. Data tables showing the response of the instrumented manikins as a function of impact level for specific measured variables are shown below.

The positive head Ry angular acceleration, neck tension, neck flexion, and resultant chest acceleration data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 5 through 8 to evaluate the effect of the headrest positioned forward. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of impact acceleration for each of the 4 assessed parameters, and are shown in Figures 11 through 14.

Table 5. Headrest Position Assessment: (+) Head Ry Angular Acceleration (Rad/S$^2$)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0” | HEADREST: 2.5” | HEADREST: 0” | HEADREST: 2.5” |
| 6 | 233 | 218 | 271 | 249 |
| 8 | 381 | 355 | 454 | 492 |
| 10 | 577 ± 6 | 463 ± 31 | 674 ± 57 | 694 ± 39 |
| 12 | 644 | 571 | 1039 | 958 |
| 15 | 992 | 825 | 1472 | 1293 |

Table 6. Headrest Position Assessment: Neck Tension (lb)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0” | HEADREST: 2.5” | HEADREST: 0” | HEADREST: 2.5” |
| 6 | 43.4 | 54.9 | 69.9 | 70.8 |
| 8 | 100 | 101 | 109 | 117 |
| 10 | 137 ± 3.7 | 152 ± 14 | 137 ± 8.5 | 141 ± 5.4 |
| 12 | 167 | 197 | 152 | 162 |
| 15 | 251 | 242 | 187 | 185 |

**Table 7. Headrest Position Assessment: Neck Torque-Flexion (in-lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0” | HEADREST: 2.5” | HEADREST: 0” | HEADREST: 2.5” |
| 6 | ⦰ | ⦰ | 127 | 118 |
| 8 | ⦰ | ⦰ | 142 | 153 |
| 10 | ⦰ | 383 ± 13 | 181 ± 7 | 173 ± 6 |
| 12 | ⦰ | 424 | 221 | 217 |
| 15 | ⦰ | 456 | 279 | 255 |

(⦰ = No data)

**Table 8. Headrest Position Assessment: Resultant Chest Acceleration (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0” | HEADREST: 2.5” | HEADREST: 0” | HEADREST: 2.5” |
| 6 | 9.57 | 9.65 | 6.39 | 6.31 |
| 8 | 14.4 | 13.4 | 8.71 | 9.04 |
| 10 | 17.4 ± 0.17 | 18.1 ± 0.40 | 11.56 ± 0.06 | 11.6 ± 0.30 |
| 12 | 20.99 | 21.7 | 15.3 | 14.4 |
| 15 | 25.8 | 26.0 | 20.1 | 19.3 |

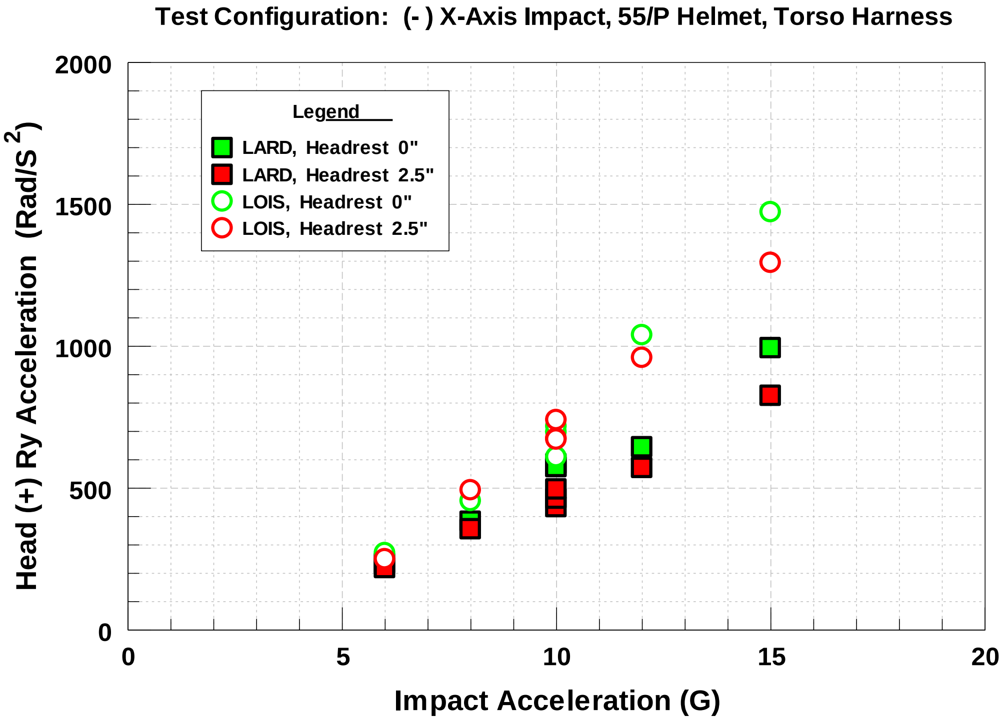


**Figure 11. Head (+) Ry Acceleration as a Function of Impact Accel. and Headrest Position**

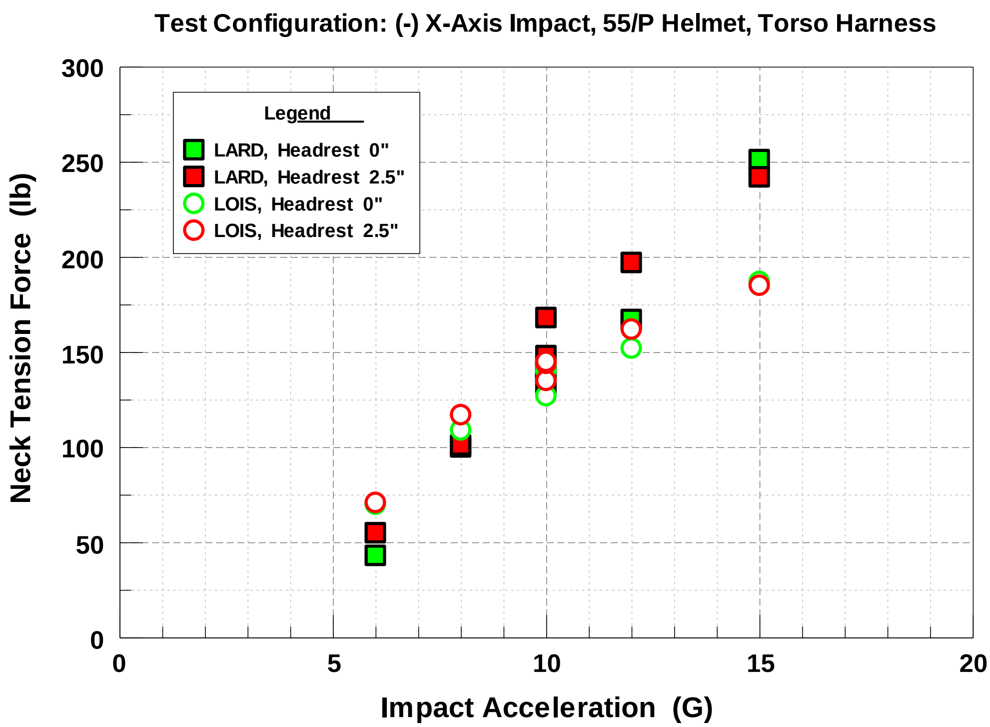


**Figure 12. Neck Tension Force as a Function of Impact Accel. and Headrest Position**

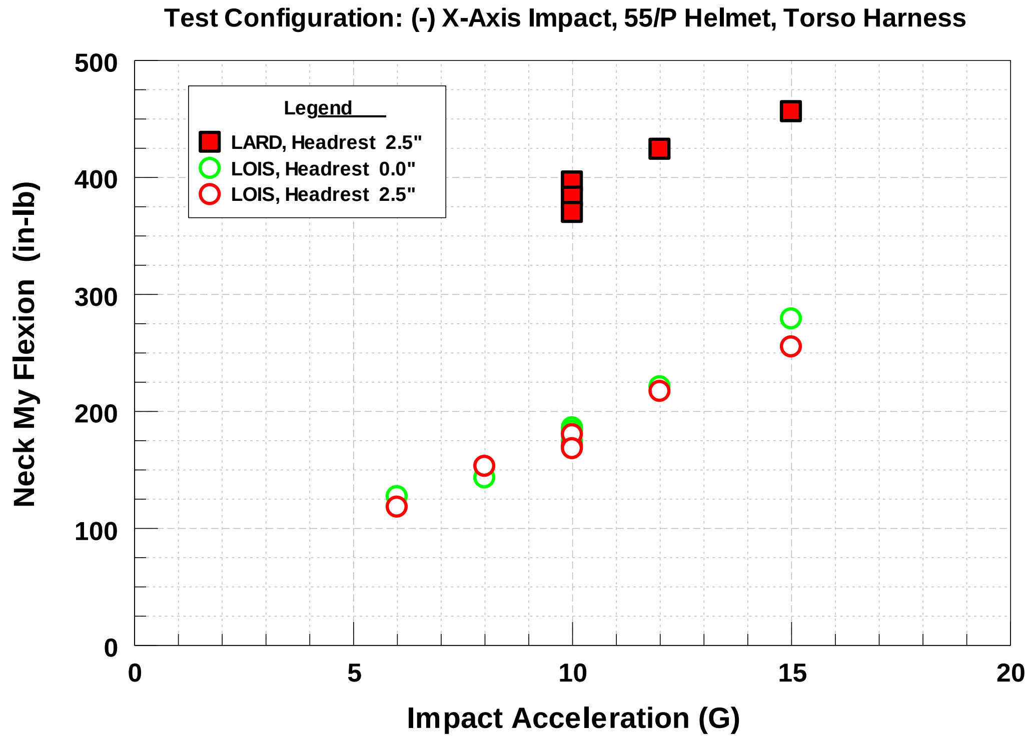


**Figure 13. Neck Flexion Torque as a Function of Impact Accel. and Headrest Position**

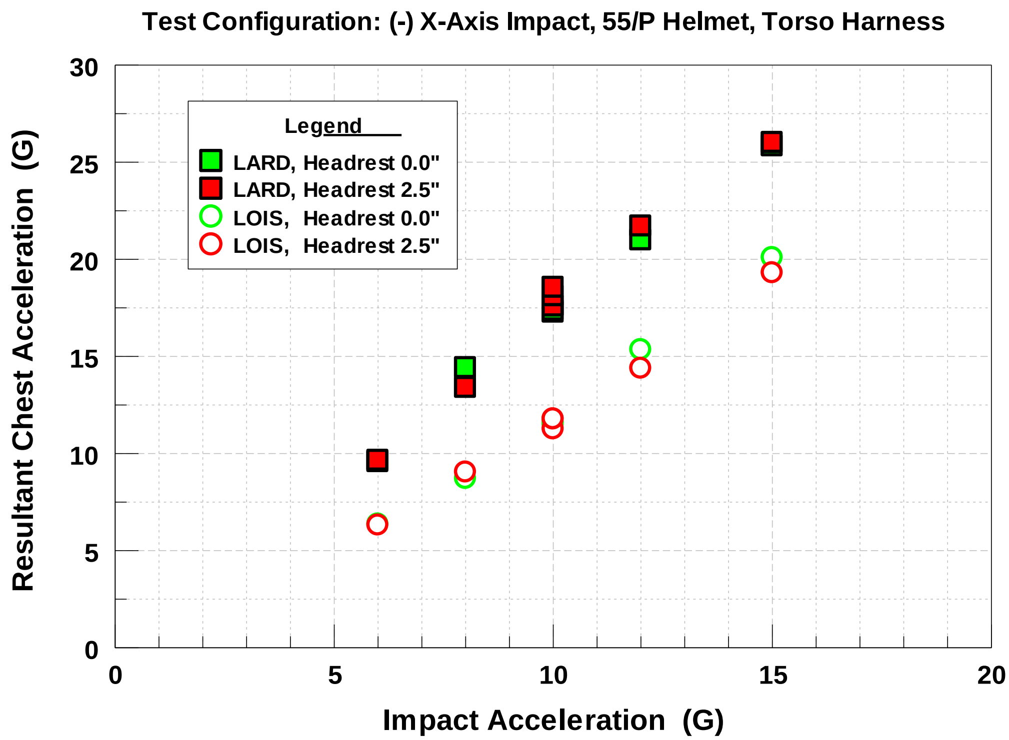


**Figure 14. Resultant Chest Accel. as a Function of Impact Accel. and Headrest Position**

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA impact configurations defined in Table 1 for Cells M and N. The four analyzed data sets indicated the consistent trend for manikin accelerations and forces to increase as a function of sled impact acceleration for both the LOIS and LARD manikins. In general, the manikin accelerations and forces followed a linear relationship which is consistent with the previous research with both manikins.

The headrest positioned 2.5" forward of the seat back had little affect on the head Ry angular acceleration, neck tension, neck flexion, and chest acceleration when compared to the baseline position. This was true for both the LOIS and LARD manikins. The LARD neck flexion data was limited due to an issue with the My Torque channel in the upper neck load cell for the baseline Cell M; however, the channel was repaired and generated realistic data starting with the 10 G impacts in the headrest forward position for Cell N. The limited data set indicated that the LARD manikin generated significantly greater flexion torque values than the LOIS manikin. The LARD manikin neck force and chest acceleration data were correspondingly equal to or greater than the LOIS manikin data at the accelerations tested, and this was especially evident at impact accelerations greater than 10 G. The LOIS manikin head Ry angular acceleration was greater than the LARD manikin head Ry angular acceleration at all the impact accelerations tested. These higher accelerations were most likely the result of the LOIS head being of less mass with a more flexible neck. which would result in greater head acceleations than the LARD when subjected to similar input energy. These data sets indicate that the headrest forward position would not appear to increase forward motion of the head and torso compared to baseline data.

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with a forward headrest during a drogue chute or main chute deployment; however, due to the measurement error of the LARD My neck torque during the impact testing for Cell M, the calculation of the Nij was not completed. Therefore, only the LOIS manikin Nij data was evaluated, and indicated that neither the baseline condition or the forward headrest condition generated Nij values in excess of the AFRL limit of 0.56. The 15 G impacts generated the largest Nij values for the LOIS of between 0.37 and 0.38. Since the Nij assessment was limited due to the issue with the LARD My torque, the Neck Tension Force was also evaluated to provide an indication of the risk of neck injury. The LOIS and the LARD manikin did not generate neck tension forces that exceeded the recommended AFRL Neck Tension force limits of 186 lbs and 357 lbs; however, LOIS did generate loads at 15 G with both headrest configurations that would produce a risk of approximately 5%.

#### 7.2.2. Helmet Weight

A comparative assessment of the data from Test Cell M and Test Cell O evaluated the effects of wearing a heavy helmet with forward and upward shift CG compared to the baseline helmet configuration (approximately 3 lb vs 5 lb respectively which includes the mask). Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The positive head Ry angular acceleration, neck tension, neck flexion, and resultant chest acceleration data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 9 through 12 to evaluate the effect of the heavy helmet. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the four assessed parameters, and are shown in Figures 15 through 18.

**Table 9. Helmet Weight Assessment: (+) Head Ry Angular Accel. (Rad/S$^2$)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HELMET: 3 lb | HELMET: 5 lb | HELMET: 3 lb | HELMET: 5 lb |
| 6 | 233 | 225 | 271 | 312 |
| 8 | 381 | 349 | 454 | 554 |
| 10 | 577 ± 6 | 672 ± 115 | 674 ± 57 | 783 ± 14 |
| 12 | 644 | 868 | 1039 | 1073 |
| 15 | 992 | 947 | 1472 | 1557 |

**Table 10. Helmet Weight Assessment: Neck Tension (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HELMET: 3 lb | HELMET: 5 lb | HELMET: 3 lb | HELMET: 5 lb |
| 6 | 43.4 | 62.3 | 69.9 | 119 |
| 8 | 100 | 106 | 109 | 166 |
| 10 | 137 ± 3.7 | 170 ± 5 | 137 ± 8.5 | 201 ± 8 |
| 12 | 167 | 221 | 152 | 246 |
| 15 | 251 | 255 | 187 | 351 |

**Table 11. Helmet Weight Assessment: Neck Flexion Torque (in-lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HELMET: 3 lb | HELMET: 5 lb | HELMET: 3 lb | HELMET: 5 lb |
| 6 | ⦰ | 365 | 127 | 134 |
| 8 | ⦰ | 454 | 142 | 172 |
| 10 | ⦰ | 538 ± 3 | 181 ± 7 | 213 ± 4 |
| 12 | ⦰ | 634 | 221 | 260 |
| 15 | ⦰ | 670 | 279 | 279 |

(⦰ = No Data)

**Table 12. Helmet Weight Assessment: Resultant Chest Acceleration (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HELMET: 3 lb | HELMET: 5 lb | HELMET: 3 lb | HELMET: 5 lb |
| 6 | 9.57 | 10.5 | 6.39 | 10.8 |
| 8 | 14.4 | 14 | 8.71 | 15.4 |
| 10 | 17.4 ± 0.17 | 19.2 ± 0.2 | 11.56 ± 0.06 | 20.1 ± 0.44 |
| 12 | 20.99 | 22.8 | 15.3 | 27.0 |
| 15 | 25.8 | 28.4 | 20.1 | 35.4 |

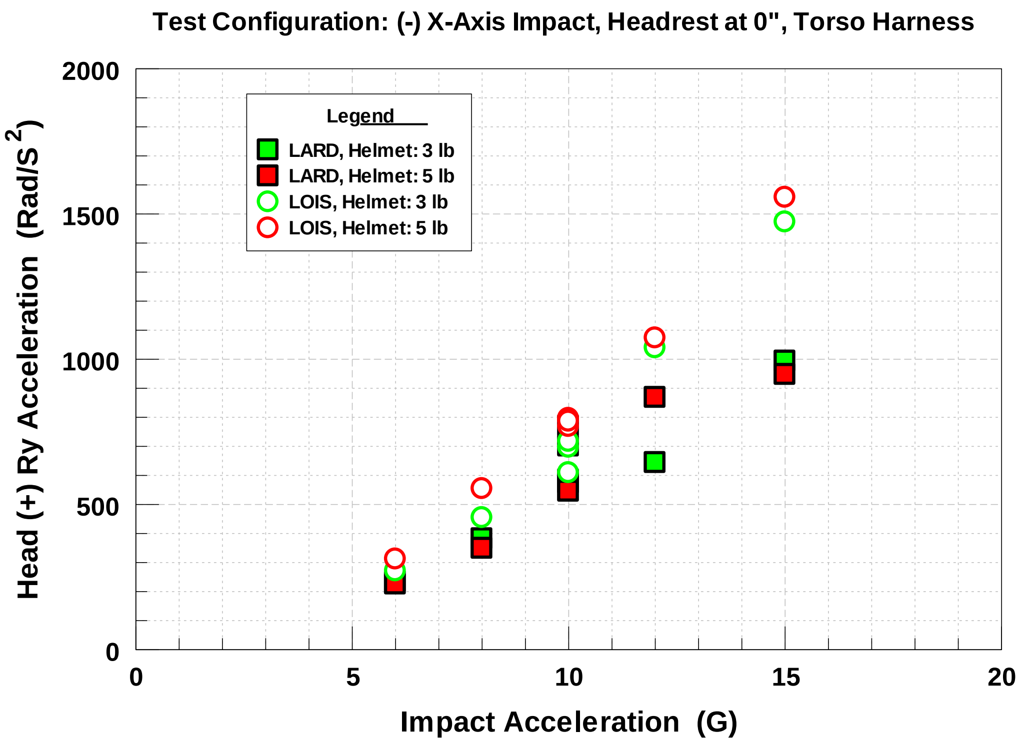


**Figure 15. Head (+) Ry Acceleration as a Function of Impact Accel. and Helmet Weight**

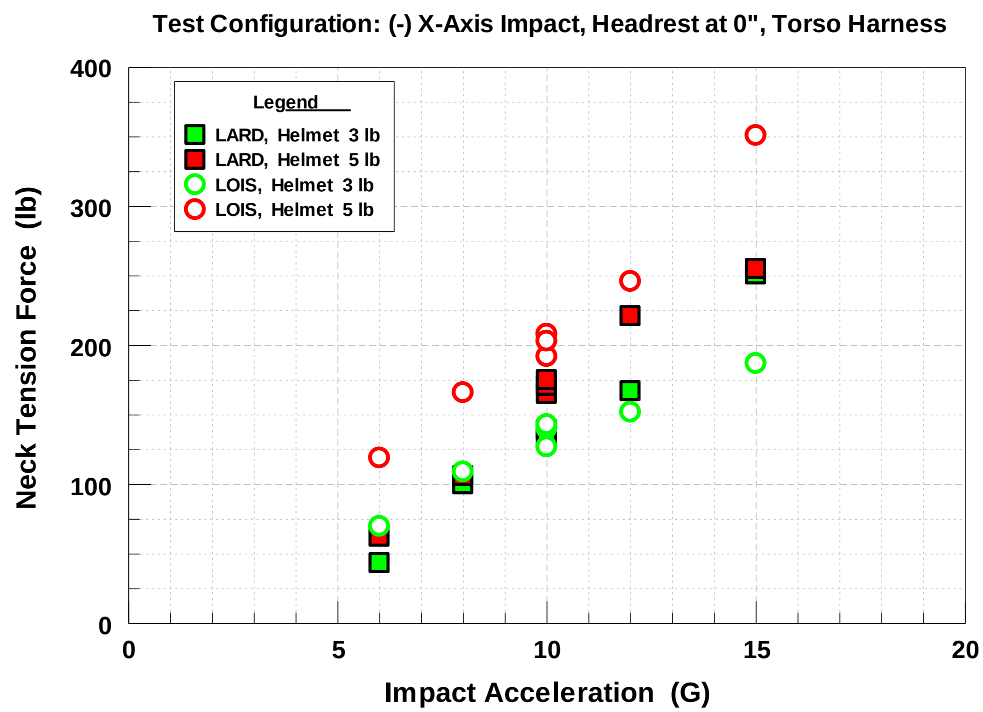


**Figure 16. Neck Tension Force as a Function of Impact Accel. and Helmet Weight**

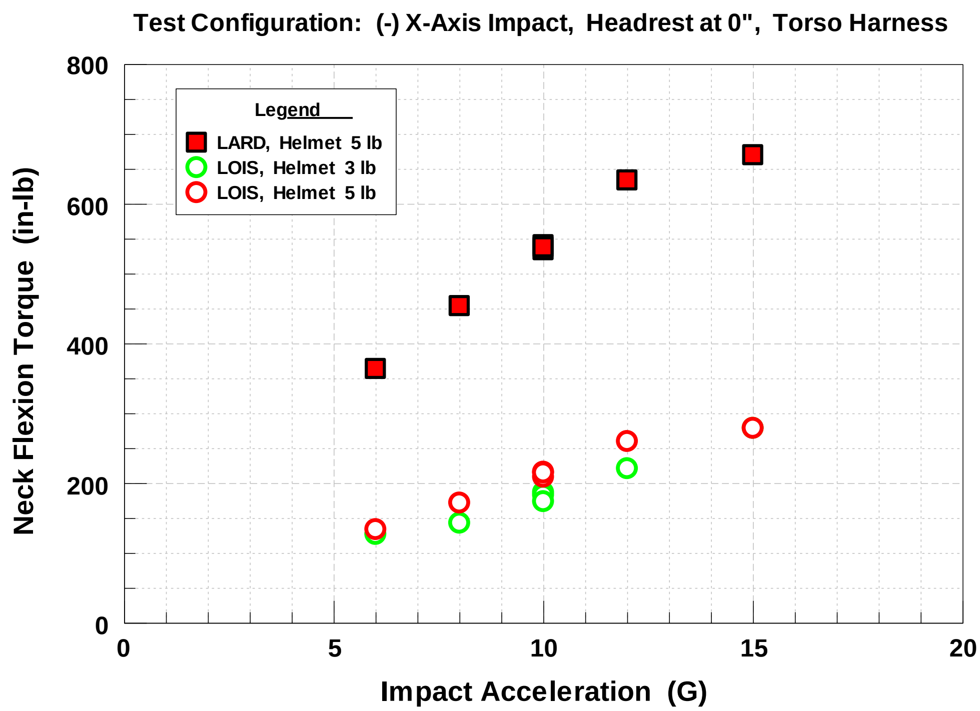


Figure 17. Flexion Torque as a Function of Impact Accel. and Helmet Weight

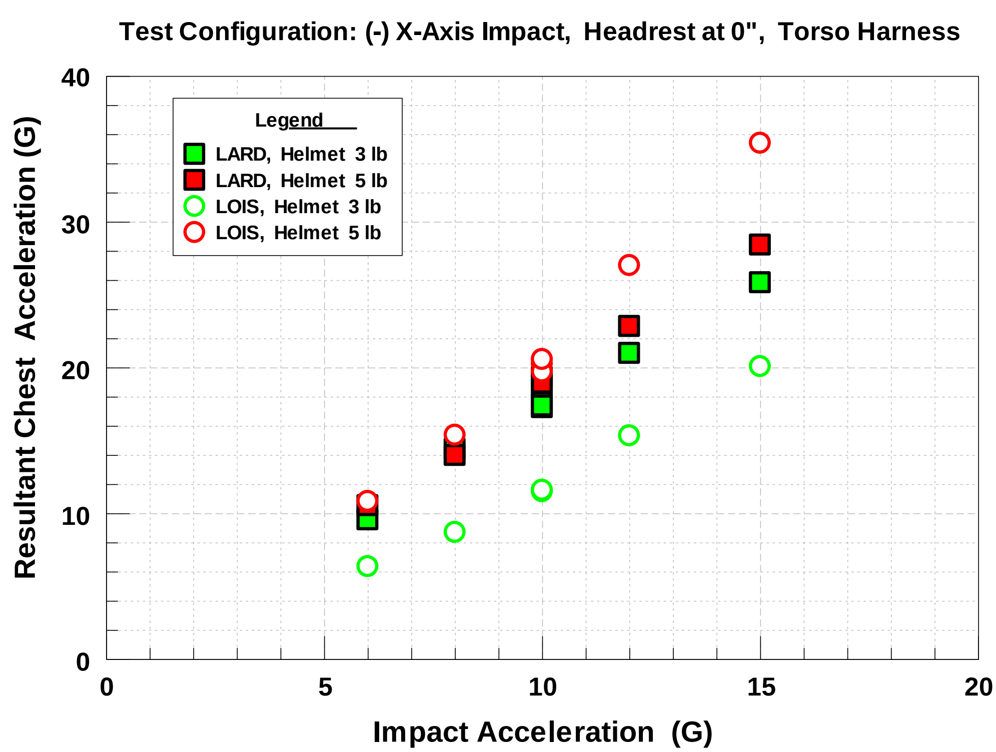


Figure 18. Resultant Chest Accel. as a Function of Impact Accel. and Helmet Weight

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA impact configurations defined in Table 1 for Cells M and O. The four analyzed data sets indicate the consistent trend to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins.

The heavy 5 lb helmet had a greater affect on the neck tension, and chest acceleration for the LOIS manikin than the LARD manikin when compared to the respective responses with the baseline 3 lb helmet. The LOIS manikin responses with the heavy helmet were greater than the responses with the baseline helmet, and this increased at impact levels above 10 G. The percent difference between the heavy helmet response and the baseline helmet response for LOIS at 15 G was greater than 75% for both the neck tension force and the chest acceleration. The LOIS manikin head Ry angular acceleration with the heavy helmet configuration was slightly greater than the baseline helmet respones, and greater than the LARD manikin responses at all the impact accelerations tested. These higher accelerations were most likely the result of the LOIS neck being more flexible resulting in greater head acceleations than the LARD when subjected to similar input energy. The LOIS My torque was not influenced by the heavier helmet. These LOIS data sets indicate that the heavy helmet increases forward motion of the head and chest, and could present a greater risk to small occupants. The LARD manikin responses with the heavy helmet were comparable to the baseline responses at the lower impact levels, but at 10 G and above the responses were greater than the baseline helmet responses. The LARD head angular acceleration and neck tension force responses at 15 G were not much different than the response with the baseline helmet. Review of additional measured parameters indicated that the response of the head at the 15 G impact may have transitioned more into the neck shear force as opposed to the neck tension force for this test, which can be shown in Figure 19. The LARD neck flexion data was limited due to an issue with the My Torque channel in the upper neck load cell for the baseline Cell M; however, the channel was repaired and generated realistic data for Cell O. The data set indicated that the LARD manikin generated significantly greater flexion torque values than the LOIS manikin. These data sets indicate that the heavy helmet increased forward motion of the head and torso compared to baseline data.

The Nij was to be calculated to provide an indication of the associated risk of neck injury to the occupant with a heavy helmet during a drogue chute or main chute deployment; however, the measurement of the LARD My neck torque during the impact testing was in error for the baseline Cell M, and calculation of the Nij was not completed. Therefore, only the LOIS manikin Nij data was evaluated. The LOIS Nij assessment indicated that the baseline condition of the 3.0 lb helmet headrest condition did not generate an Nij value in excess of the AFRL limit, but the heavy helmet condition met or exceeded the AFRL limit of 0.56 by generating an Nij value of 0.56 in tension/flexion and an Nij value of 0.60 in tension/extension at the 15 G impact level.

Since the Nij assessment was limited due to the issue with the LARD My torque, the Neck Tension Force was also evaluated to provide an indication of the risk of neck injury. The LARD manikin did not generate neck tension forces that exceeded the recommended AFRL Neck

Tension force limit of 357 lb; however, the LOIS manikin did generate neck tension forces that exceeded the recommended AFRL Neck Tension force limit of 186 lb with the heavy helmet at the 10, 12, and 15 G impact levels. The LOIS neck tension forces at those impact levels with the heavy helmet generated corresponding probability of AIS 2 or greater injury levels of 7.1%, 17.8%, and 71.3% respectively for small occupants (136 lbs or less). It should also be noted that the baseline helmet generated an approximate risk of 5% for LOIS at the 15 G impact level.

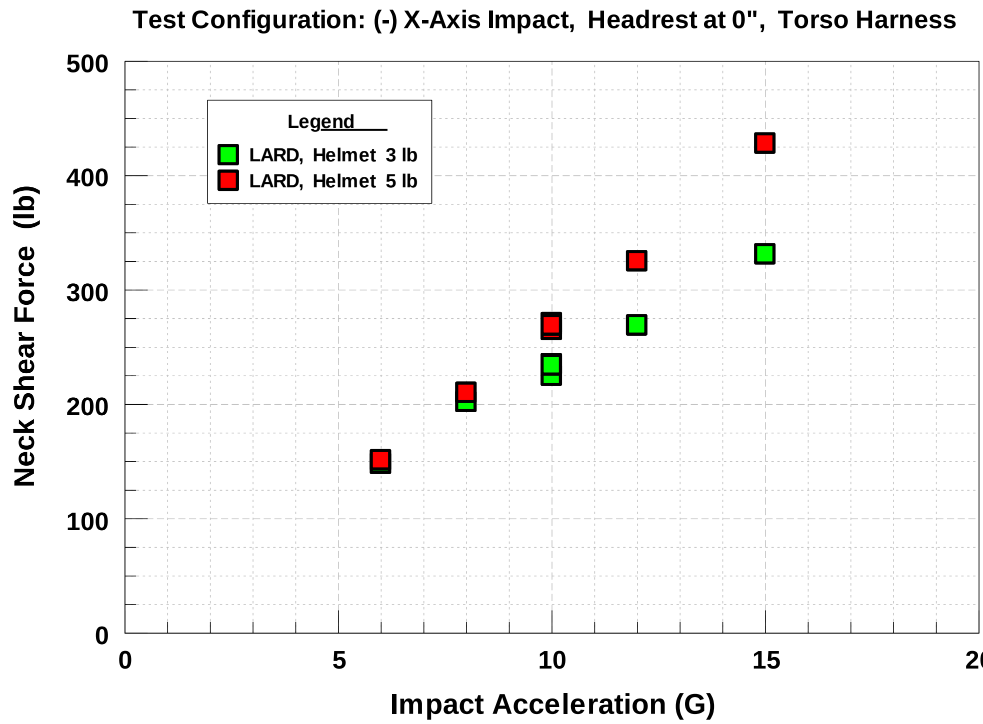


**Figure 19. Neck Shear Force as a Function of Impact Acceleration and Helmet Weight**

### 7.2.3. Restraint Harness

A comparative assessment of the data from Test Cell M and Test Cell P evaluated the effects of using a seat mounted harness configuration compared to the baseline torso mounted harness. Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The neck tension force, resultant chest acceleration, lumbar compressive force, and Lumbar My flexion (positive My torque) data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 13 through 16 to evaluate the effect of the seat mounted harness. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 20 through 23.

**Table 13. Restraint Harness Assessment: Neck Tension Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 43.4 | 74.5 | 69.9 | 68.3 |
| 8 | 100 | 123 | 109 | 111 |
| 10 | 137 ± 3.7 | 158 ± 6.5 | 137 ± 8.5 | 127 ± 7.4 |
| 12 | 167 | 204 | 152 | 157 |
| 15 | 251 | 212 | 187 | 185 |

**Table 14. Restraint Harness Assessment: Resultant Chest Acceleration (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 9.57 | 9.48 | 6.39 | 8.31 |
| 8 | 14.4 | 13.3 | 8.71 | 9.15 |
| 10 | 17.4 ± 0.17 | 17.8 ± 0.5 | 11.56 ± 0.06 | 11.4 ± 0.5 |
| 12 | 20.99 | 22.3 | 15.3 | 15.7 |
| 15 | 25.8 | 27.5 | 20.1 | 21.3 |

**Table 15. Restraint Harness Assessment: Lumbar Compressive Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 553 | 361 | 125 | 161 |
| 8 | 629 | 550 | 152 | 163 |
| 10 | 916 ± 48 | 720 ± 70 | 230 ± 6 | 262 ± 13 |
| 12 | 1160 | 809 | 286 | 406 |
| 15 | 1357 | 927 | 340 | 573 |

**Table 16. Restraint Harness Assessment: Lumbar My Flexion Torque (in-lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 82 | 100 | 82 | 122 |
| 8 | 217 | 108 | 114 | 160 |
| 10 | 239 ± 82 | 129 ± 20 | 122 ± 38 | 225 ± 44 |
| 12 | 431 | 205 | 267 | 226 |
| 15 | 667 | 278 | 402 | 365 |

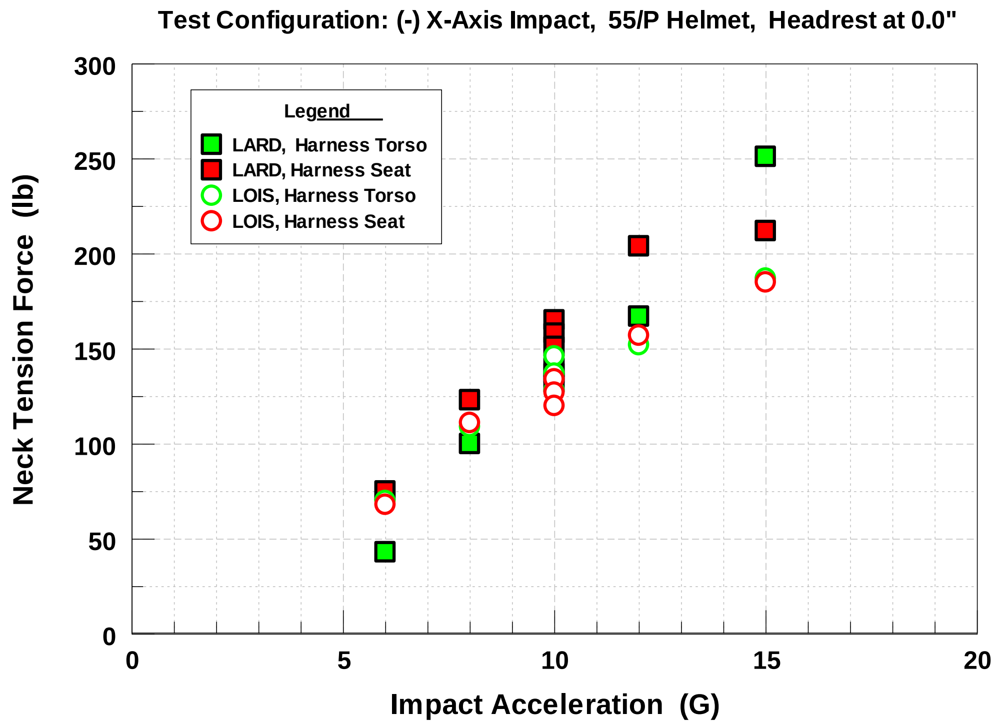


**Figure 20. Neck Tension Force as a Function of Impact Accel. and Restraint Harness**

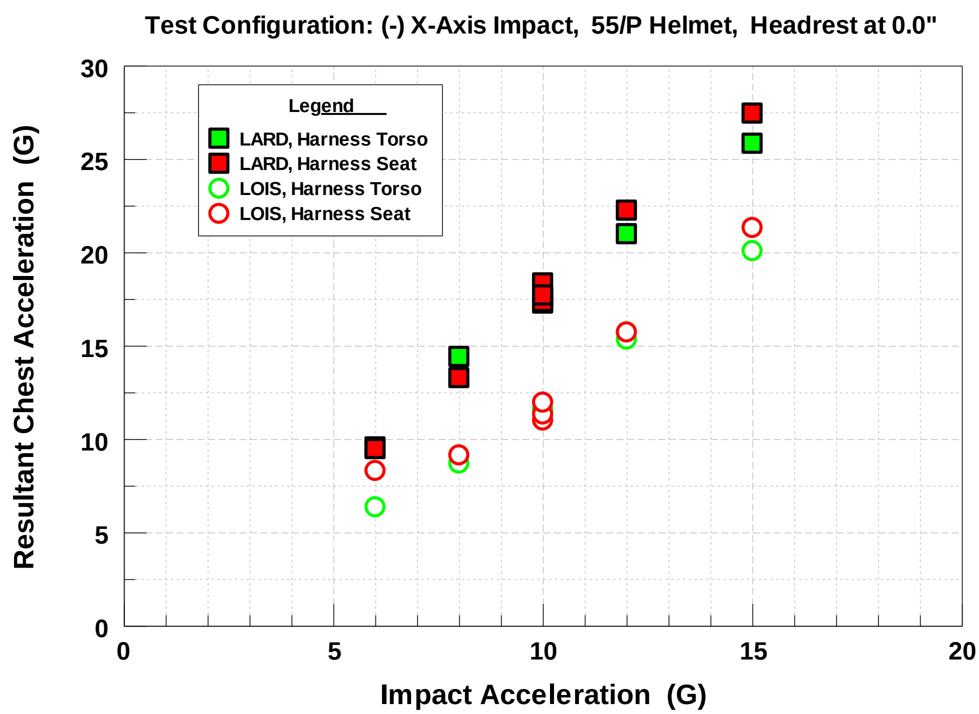


**Figure 21. Resultant Chest Accel. as a Function of Impact Accel. and Restraint Harness**

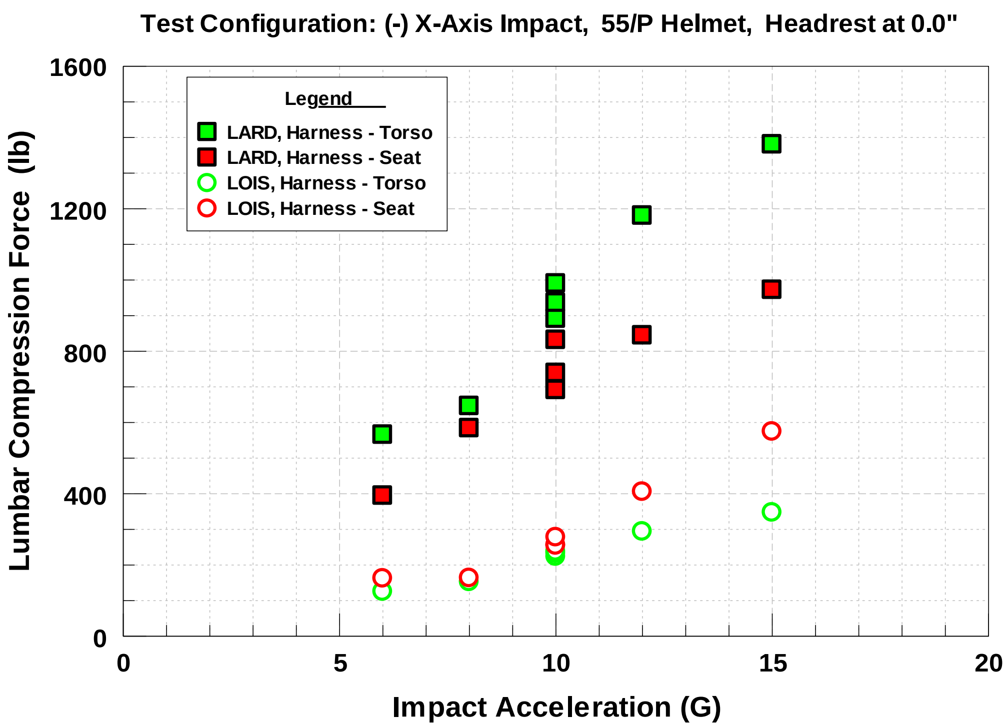


**Figure 22. Lumbar Compression as a Function of Impact Accel. and Restraint Harness**

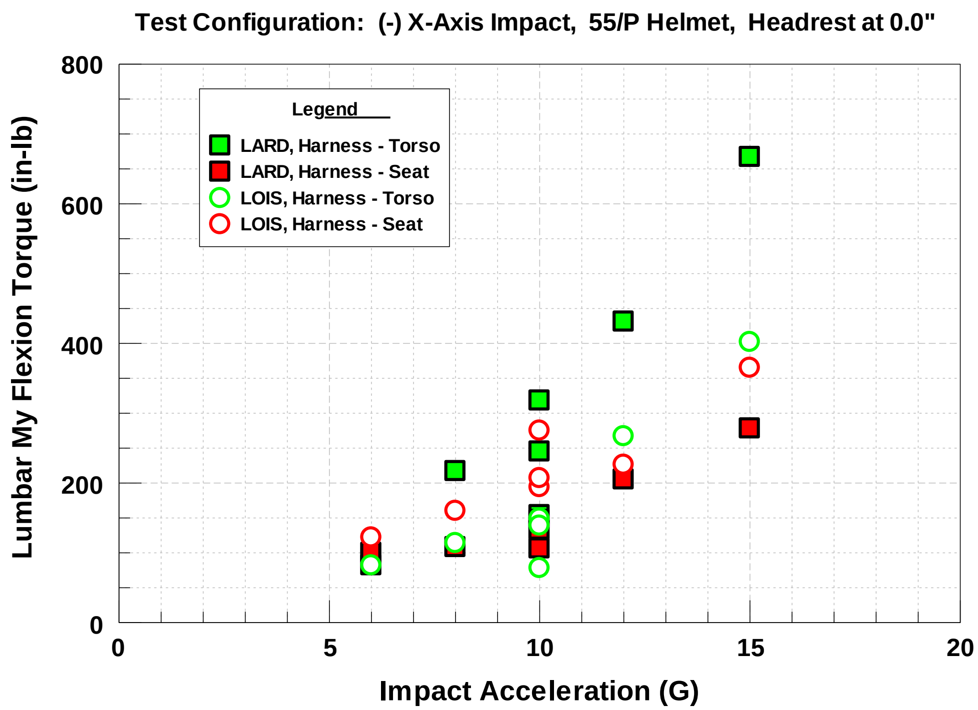


**Figure 23. Lumbar My Flexion as a Function of Impact Accel. and Restraint Harness**

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for the HIA impact configurations defined in Table 1 for Cells M and P. The four analyzed data sets indicate the consistent trend to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins.

The seat-mounted harness had minimal affect on the neck tension load and the chest acceleration for both manikins as compared to the baseline torso harness, although the data was slightly greater for the seat-mounted harness for both parameters and both manikins. The LARD manikin generated greater responses relative to the LOIS manikin response for neck tension load and chest acceleration. The seat-mounted harness decreased the response of the LARD manikin for both the lumbar compression and the lumbar positive My torque compared to the baseline torso harness, and this was more apparent at the 10 to 15 G impact levels. However, it should be noted that the LARD manikin's negative My torque values (lumbar My extension) were 2-3 times greater than the positive values at each impact level and for each harness configuration, and achieved a value over 1700 in-lb at 15 G. This would indicate that both harnesses would appear to be causing the LARD manikin to load the dorsal aspect of the lumbar load cell (spinous and transverse processes for a human spine). The seat-mounted harness produced slightly larger lumbar compressive forces at the higher impact acceleration levels in the LOIS compared to the torso harness, and slighly lower lumbar positive My torques in the LOIS compared to the torso harness.

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with either the torso or seat harness during a drogue chute or main chute deployment. The measurement of the LARD My neck torque during the impact testing with the baseline torso harness was in error and calculation of the Nij was not completed. Therefore, the LARD Nij calculations were only completed for the seat harness configuration, and did not generate any values that exceeded the AFRL limit of 0.56. The LOIS manikin Nij data was calculated and evaluated for both harness configurations, and indicated that neither configuration generated Nij values in excess of the AFRL limits.

The neck tension force was also evaluated to provide an indication of the risk of neck injury. The LOIS and LARD manikin did not generate neck tension forces that exceeded the recommended AFRL Neck Tension Force limit of 186 lb and 357 lb respectively; however, it should be noted that the LOIS did generate loads at 15 G impact acceleration with each harness configuration which would produce an injury risk of approximately 5%.

The lumbar compressive force was also evaluated to provide an indication of the risk of spinal injury. The LOIS did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limit of 933 lb, nor the limit of 653 lb with lumbar flexion with either harness configuration. The LARD manikin did not generate lumbar compressive forces greateer than the AFRL Lumbar Compression Force limit of 1757 lb.

### 7.2.4. Simulated Ejection Seat Configuration

A comparative assessment of the data from Test Cell M and Test Cell Q evaluated the effects of the proposed JSF-style ejection seat configuration compared to the baseline USAF-style ejection seat configuration. The baseline ejection seat configuration was defined as in-line headrest (0”), HGU-55/P helmet, and torso harness. The JSF-style ejection seat configuration was defined as forward headrest (2.5”), JSF Gen II mock-up helmet, and SCH harness (seat-mounted). Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The neck tension force, resultant chest acceleration, lumbar compressive force, and lumbar My flexion data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 17 through 20 to evaluate the effect of the seat mounted harness. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 24 through 27.

**Table 17. Simulated Seat Configuration: Neck Tension Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Baseline | JSF-Style | Baseline | JSF-Style |
| 6 | 43.4 | 80 | 69.9 | 94 |
| 8 | 100 | 156 | 109 | 151 |
| 10 | 137 ± 3.7 | 190 ± 14 | 137 ± 8.5 | 174 ± 9 |
| 12 | 167 | 232 | 152 | 228 |
| 15 | 251 | 357 | 187 | 285 |

**Table 18. Simulated Seat Configuration: Resultant Chest Acceleration (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Baseline | JSF-Style | Baseline | JSF-Style |
| 6 | 9.57 | 10.55 | 6.36 | 7.92 |
| 8 | 14.42 | 15.03 | 8.71 | 14.88 |
| 10 | 17.41 ± 0.17 | 18.6 ± 0.77 | 11.56 ± 0.06 | 20.84 ± 0.31 |
| 12 | 20.99 | 21.44 | 15.34 | 28.3 |
| 15 | 25.83 | 30.64 | 20.08 | 33.7 |

**Table 19. Simulated Seat Configuration: Lumbar Compressive Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Baseline | JSF-Style | Baseline | JSF-Style |
| 6 | 553 | 488 | 125 | 385 |
| 8 | 629 | 682 | 152 | 182 |
| 10 | 916 ± 48 | 722 ± 21 | 230 ± 6 | 243 ± 32 |
| 12 | 1160 | 923 | 286 | 323 |
| 15 | 1357 | 1036 | 340 | 453 |

Table 20. Simulated Seat Configuration: Lumbar My Flexion Torque (in-lb)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Baseline | JSF-Style | Baseline | JSF-Style |
| 6 | 82 | 121 | 82 | 210 |
| 8 | 217 | 132 | 114 | 198 |
| 10 | 239 ± 82 | 171 ± 4 | 122 ± 38 | 287 ± 13 |
| 12 | 431 | 151 | 267 | 435 |
| 15 | 667 | 138 | 402 | 493 |

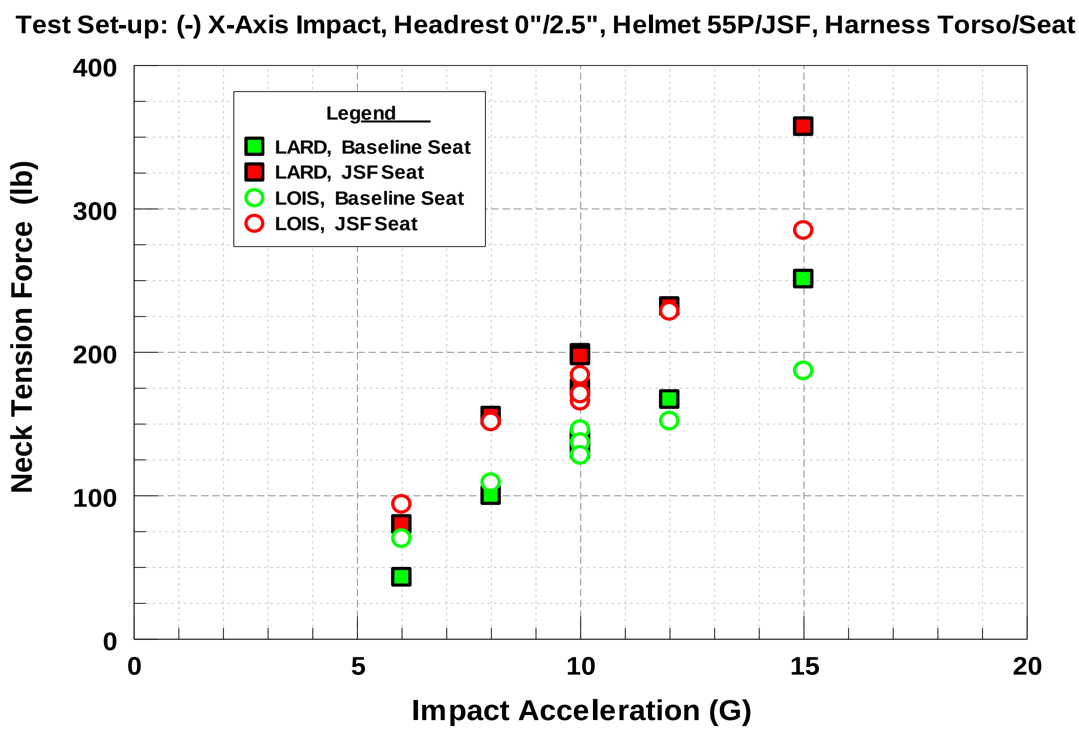


Figure 24. Neck Tension as a Function of Impact Accel. and Seat Configuration

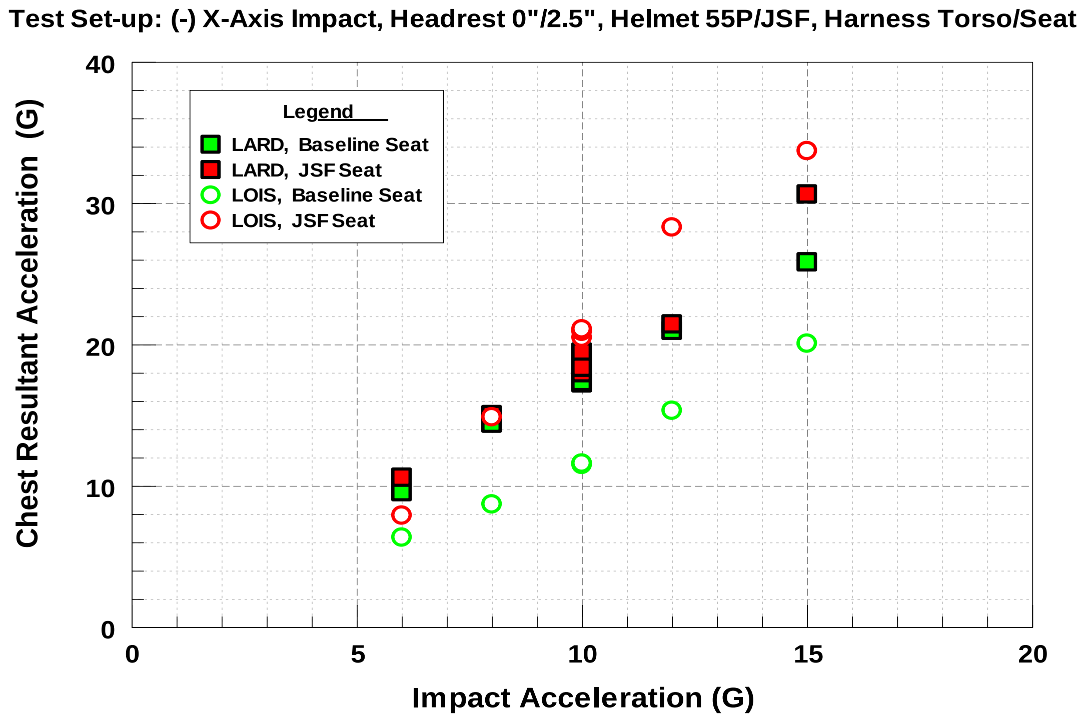


**Figure 25. Chest Accel. as a Function of Impact Accel. and Seat Configuration**

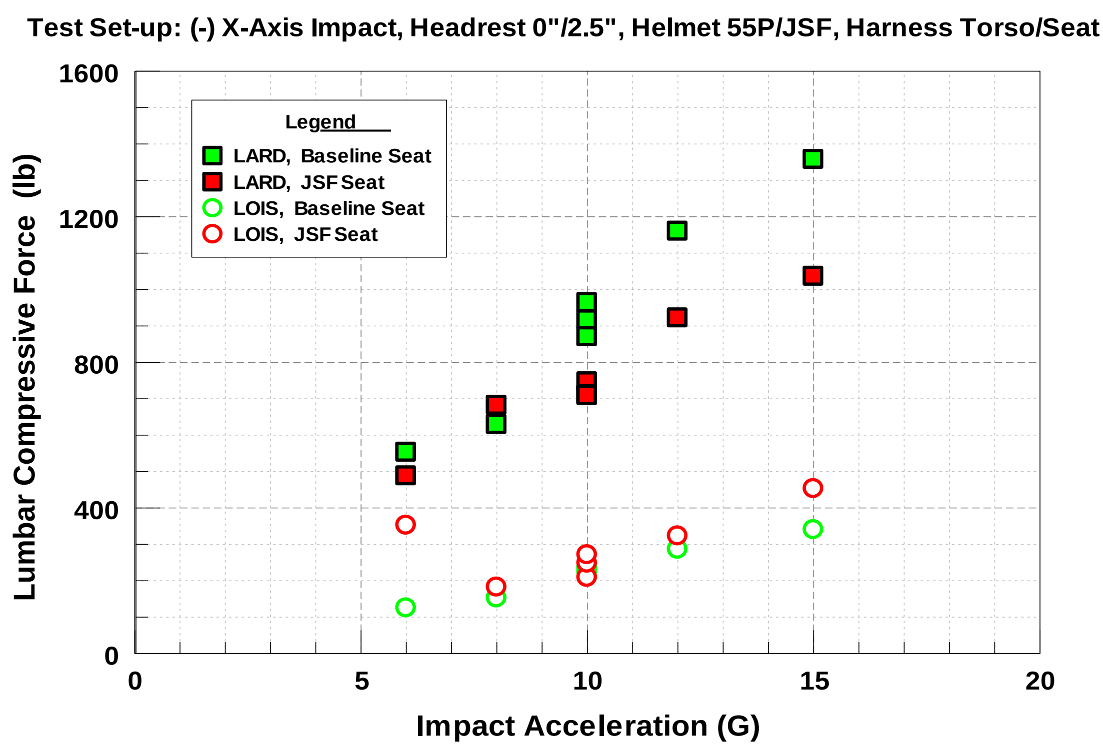


**Figure 26. Lumbar Compression as a Function of Impact Accel. and Seat Configuration**

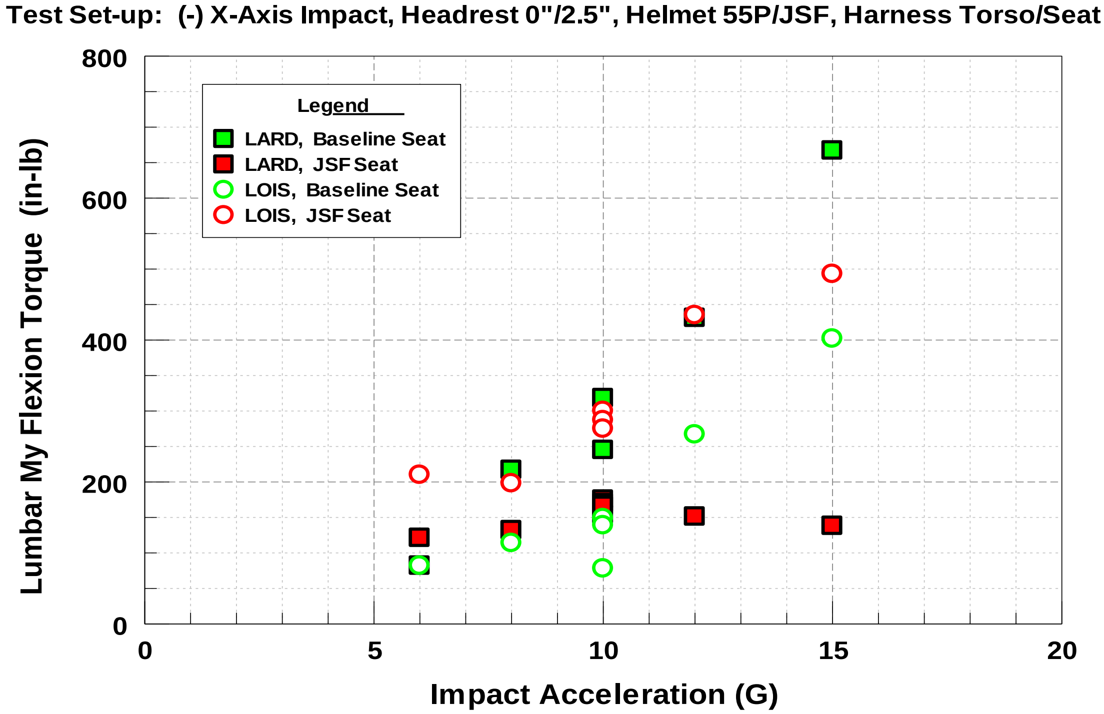


**Figure 27. Lumbar My Flexion Torque as a Function of Impact Accel. and Seat Configuration**

Testing was successfully completed at all impact accelerations (6, 8, 10, 12 and 15 G) for the HIA impact configurations defined in Table 1 for Cells M and Q. The four analyzed data sets indicate the consistent trend for manikin acceleration and forces to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins. The exception to this was the Lumbar My Flexion measured in the LARD manikin which did not show much variation over the impact range of 6 to 15 G.

The JSF-style ejection seat configuration had a noticable affect on the neck tension force and the chest acceleration for both manikins as compared to the baseline seat configuration. The neck tension force for the JSF-style configuration was approximately 50% greater compared to the baseline configuration for both the LOIS and LARD manikin across the tested impact levels. The chest acceleration for the JSF-style configuration had a much larger increase compared to the baseline configuration for the LOIS compared to the LARD manikin, and increased from approximately 30 to 100% across the tested impact levels. The LARD generated greater responses relative to the LOIS manikin responses for neck tension load and chest acceleration accept for the LOIS chest accelerations at 12 and 15 G which were the highest values for all the tests at 28 and 34 G respectively. The JSF-style seat configuration generated slightly greater lumbar compressive force and lumbar My flexion values for the LOIS manikin compared to the baseline. In contrast, the JSF configuration with the LARD manikin generated lower values for both the lumbar compression and the lumbar My flexion compared to the baseline, and this was more apparent at the 10 to 15 G impact levels. As with the previous parameter comparison

(harness variation), it should be noted that the LARD manikin's negative My torque values (lumbar My extension) were 2-3 times greater than the positive values at each impact level and this was most noticable for the JSF configuration as compared to the baseline. This would indicate that both seat configurations appear to be inducing an increase in the forces in the dorsal aspect of the lumbar spine (spinous and transverse processes for human spine) for the larger manikin, and this is shown in Figure 28.

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with either the torso or seat harness during a drogue chute or main chute deployment. The measurement of the LARD My neck torque during the impact testing with the baseline torso harness was in error and calculation of the Nij was not completed. Therefore, the LARD Nij calculations were only completed for the JSF configuration, and did not generate any values that exceeded the AFRL limit. The LOIS manikin Nij data was calculated and evaluated for both the baseline seat the and JSF seat configurations, and the JSF seat configuration generated a Nij tension/extension value of 0.62 at the 15 G impact, which exceeds the AFRL limit of 0.56.

The neck tension force was also evaluated to provide an indication of the risk of neck injury. The LOIS manikin generated neck tension forces that exceeded the recommended AFRL Neck Tension Force limit of 186 lb in the JSF configuration of 228 lb and 285 lb at 12 and 15 G respectively, and this corresponded to a probability of AIS 2 or greater injury of 5.8% and 15.2% respectively. The LARD did generate a neck tension load in the JSF configuration of 357 lb at 15 G, and this corresponds to a probability of injury at AIS 2 or greater of 5% which is at the acceptable limit.

The lumbar compressive force was also evaluated to provide an indication of the risk of spinal injury. The LOIS manikin did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limits of 933 lb or 653 lb with lumbar flexion. The LARD manikin did not generate lumbar compressive forces greateer than the AFRL Lumbar Compression Force limit of 1757 lb.

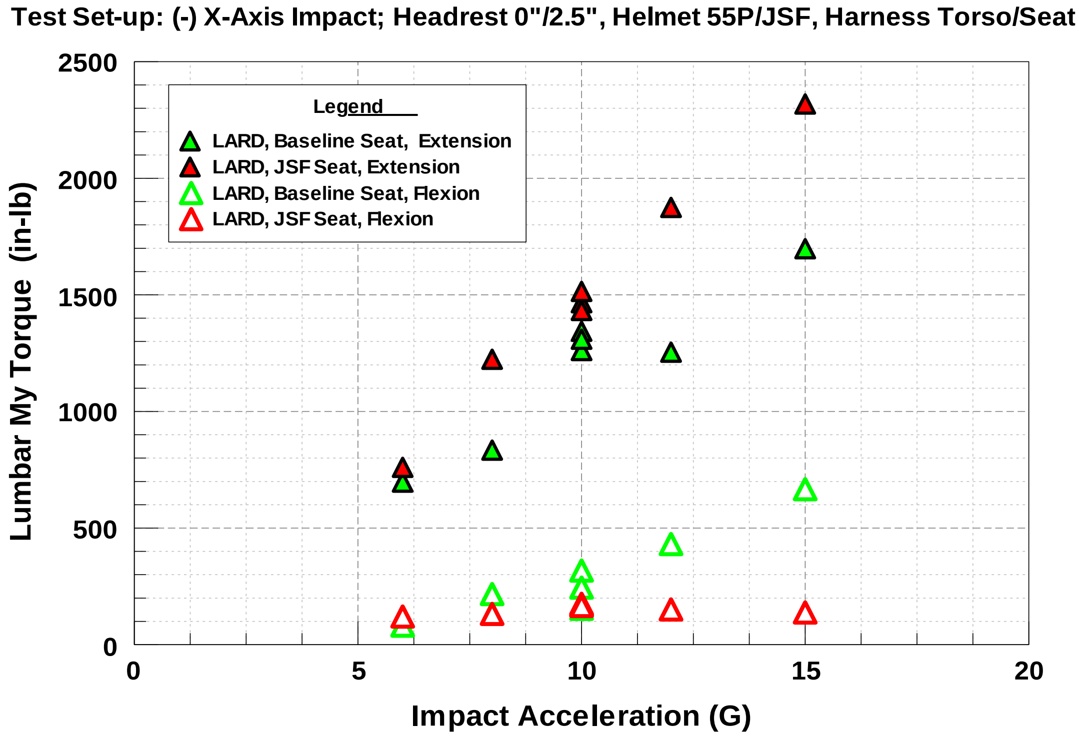


**Figure 28. LARD Lumbar My Torque as a Function of Impact Accel. and Operational Configuration**

### 7.2.5. Seat Tilt Position

A comparative assessment of the data from Test Cell M and Test Cell S evaluated the effects of tilting or reclining the seat back 45° from the vertical. The baseline configuration was defined as in-line headrest (0"), HGU-55/P helmet, torso harness, and seat fixture upright in the vertical or 0° position. The reclined seat configuration was defined as inline headrest (0"), HGU-55/P helmet, torso harness, and seat fixture reclined backwards 45°. Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The neck tension force, resultant chest acceleration, lumbar compressive force, and lumbar My flexion data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 21 through 24 to evaluate the effect of the seat tilt position. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 29 through 32.

Table 21. Seat Tilt Assessment: Neck Tension Force (lb)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Vertical | Reclined | Vertical | Reclined |
| 6 | 43.4 | 42.3 | 69.9 | 41.1 |
| 8 | 100 | 90.4 | 109 | 92.0 |
| 10 | 137 ± 3.7 | 143.4 ± 3 | 137 ± 8.5 | 117.7 ± 8 |
| 12 | 167 | 194 | 152 | 129 |
| 15 | 251 | 254 | 187 | 141 |

Table 22. Seat Tilt Assessment: Resultant Chest Acceleration (G)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Vertical | Reclined | Vertical | Reclined |
| 6 | 9.57 | 8.99 | 6.36 | 8.3 |
| 8 | 14.4 | 12.47 | 8.71 | 11.8 |
| 10 | 17.4 ± 0.17 | 15.3 ± 0.14 | 11.56 ± 0.06 | 14.1 ± 0.9 |
| 12 | 21.0 | 18.7 | 15.34 | 17.4 |
| 15 | 25.8 | 22.6 | 20.08 | 22.7 |

**Table 23. Seat Tilt Assessment: Lumbar Compressive Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Vertical | Reclined | Vertical | Reclined |
| 6 | 553 | 720 | 125 | 361 |
| 8 | 629 | 962 | 152 | 481 |
| 10 | 916 ± 48 | 1141 ± 11 | 230 ± 6 | 597 ± 14 |
| 12 | 1160 | 1402 | 286 | 714 |
| 15 | 1357 | 1733 | 340 | 872 |

**Table 24. Seat Tilt Assessment: Lumbar My Flexion (in-lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | Vertical | Reclined | Vertical | Reclined |
| 6 | 82 | 42 | 82 | 338 |
| 8 | 217 | 41 | 114 | 211 |
| 10 | 239 ± 82 | 93 ± 25 | 122 ± 38 | 219 ± 73 |
| 12 | 431 | 74 | 267 | 180 |
| 15 | 667 | 40 | 402 | 284 |

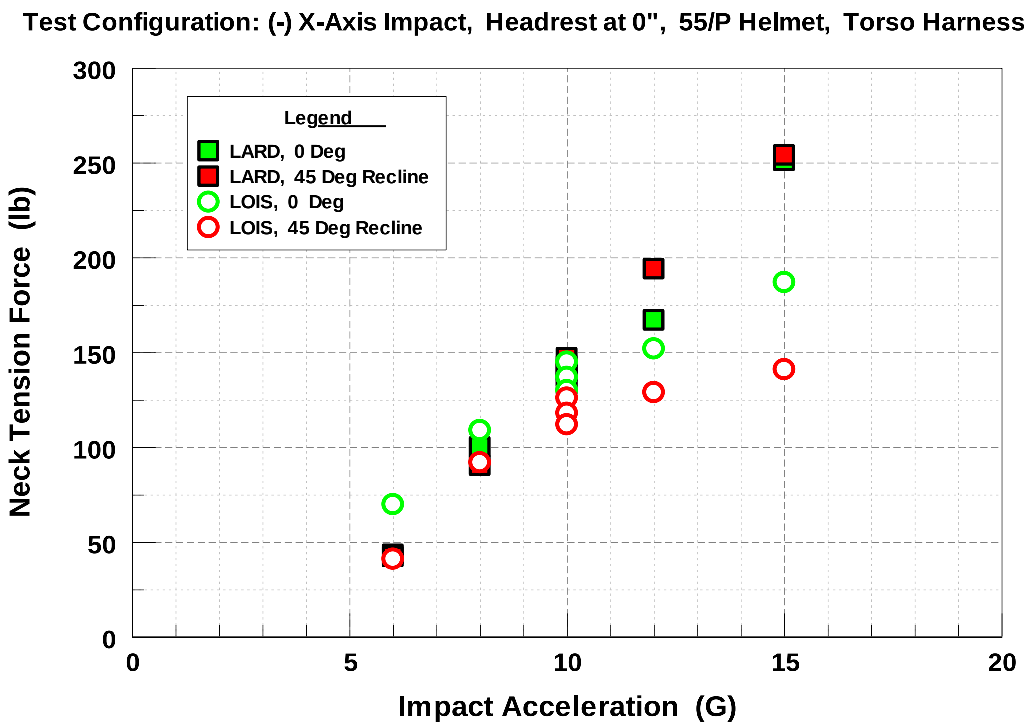


Figure 29. Neck Tension as a Function of Impact Accel. and Seat Tilt Variation

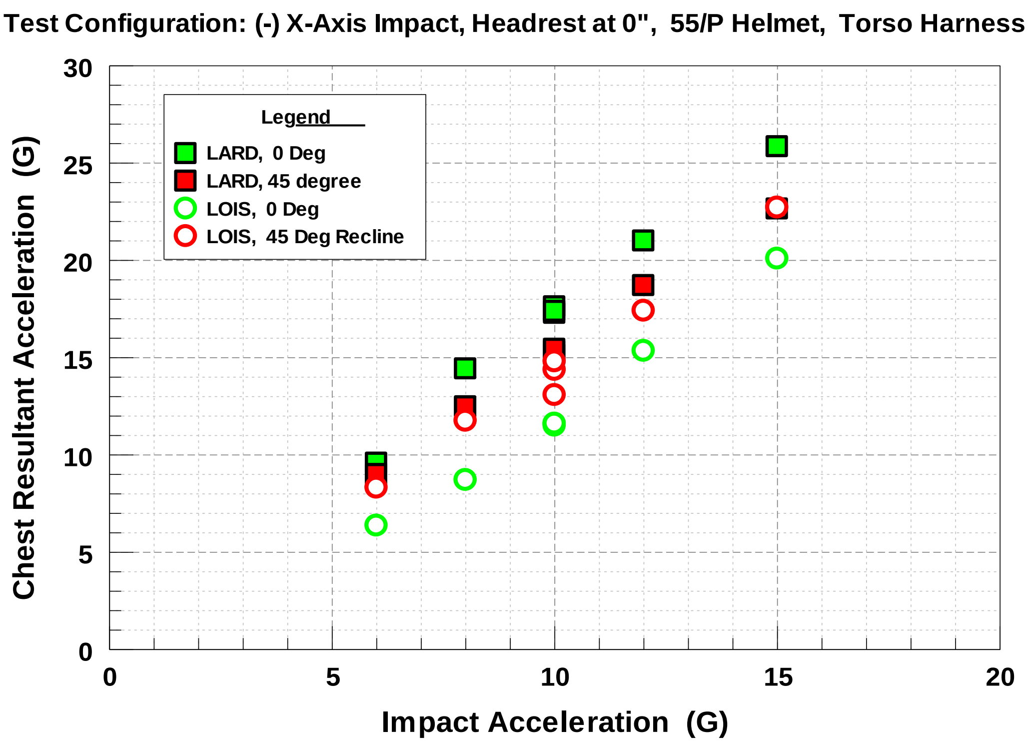


Figure 30. Chest Resultant Accel. as a Function of Impact Accel. and Seat Tilt Variation

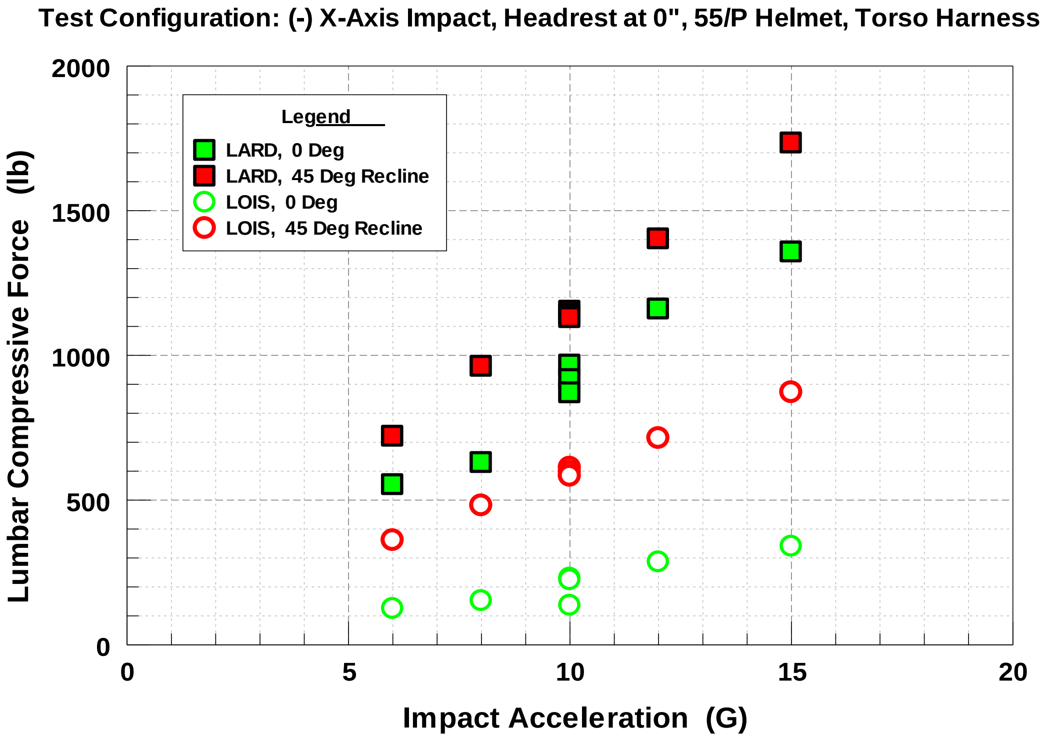


**Figure 31. Lumbar Compression as a Function of Impact Accel. and Seat Tilt Variation**

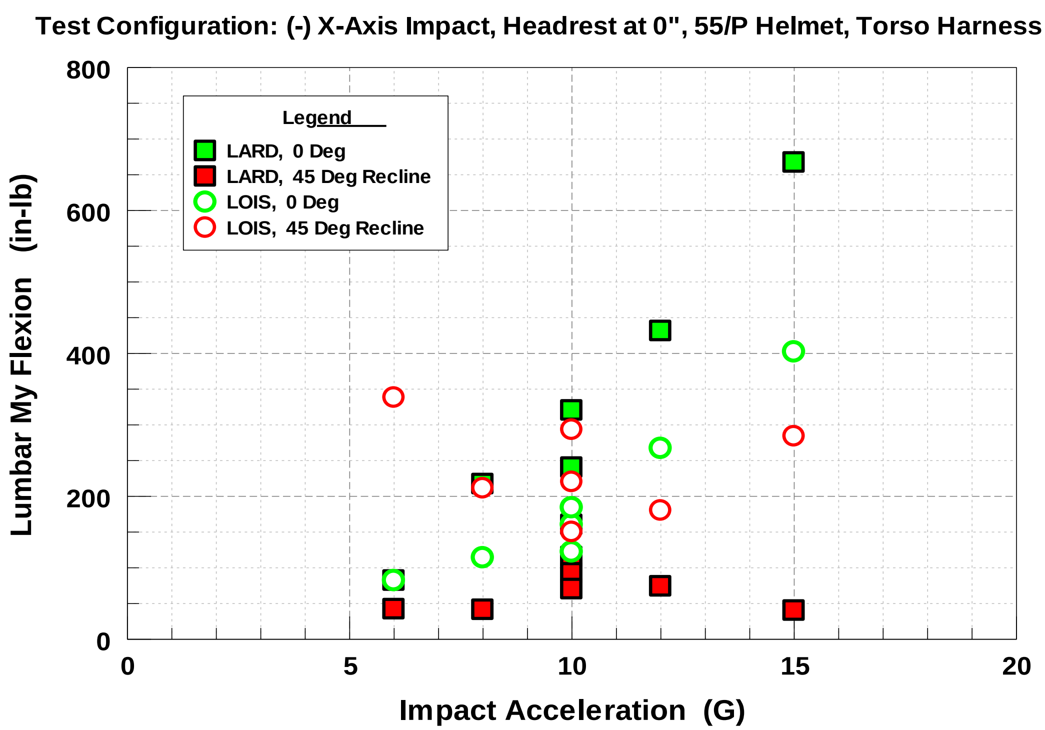


**Figure 32. Lumbar My Flexion as a Function of Impact Accel. and Seat Tilt Variation**

Testing was successfully completed at all impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA configurations defined in Table 1 for Cells M and S. The four analyzed data sets indicate the consistent trend for manikin accelerations and forces to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins. The exception to this was the Lumbar My Flexion measured in the LOIS and the LARD manikins which did not show much variation over the impact range of 6 to 15 G.

The reclined seat configuration had a noticable affect on the neck tension force and the chest acceleration for the LOIS manikin as compared to the baseline upright seat. The chest acceleration increased between 15 to 35% at all impact accelerations for the reclined seat compared to the upright seat, and the neck tension decreased 15-25% at the higher impact acceleations for the reclined seat compared to the upright seat. The reclined seat configuration slightly increased the neck tension force and slightly decreased the chest acceleration for the LARD manikin as compared to the baseline upright seat across the applied impact acceleration levels. The LARD generated greater responses relative to the LOIS manikin responses for neck tension load and chest acceleration for each respective seat configuration. The reclined seat configuration generated significantly greater lumbar compressive force values for both the LOIS and LARD manikins compared to the baseline, with increases of approximately 50% for the LARD responses and up to 100% for the LOIS responses. The reclined seat configuration had a noticable affect by decreasing the magnitude of the lumbar My flexion for both manikins, particularly at the higher impact acceleration levels. As with the previous parameter comparisons (harness variation and operational configuration), it should be noted that the LARD manikin's negative My torque values (lumbar My extension) were an order of mangintude greater (2-3 times) than the positive My flexion values at each impact level for the reclined seat configuration. This would indicate that the reclined seat configuration would appear to be inducing an increase in the forces in the dorsal aspect of the lumbar spine (spinous and transverse processes for human spine) for a larger occupant, and is shown in Figure 33.

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with either the upright or reclined seat during a drogue chute or main chute deployment. The measurement of the LARD My neck torque during the impact testing with the baseline upright seat was in error and calculation of the Nij was not completed. Therefore, the LARD Nij calculations were only completed for the reclined seat configuration, and did not generate any values that exceeded the AFRL limit. The LOIS manikin Nij data was calculated and evaluated for both the baseline seat the and the reclined seat configurations, and also did not generate any values that exceeded either AFRL limit. The neck tension force was also evaluated to provide an indication of the risk of neck injury. The LOIS and LARD manikin did not generated neck tension forces that exceeded the recommended AFRL Neck Tension Force limit of 186 lb and 357 lb respectively.

The lumbar compressive force was also evaluated to provide an indication of the risk of spinal injury. The LOIS manikin did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limits of 933 lb or 653 lb with lumbar flexion. The LARD manikin did not generate lumbar compressive forces greateer than the AFRL Lumbar Compression Force limit of 1757 lb, but did exceed the 1230 lb limit with lumbar flexion with the upright seat

configuraton at 15 G. The 1230 lb limit was also exceeded with the reclined seat and the LARD manikin at both 12 and 15 G, but since there was very little if any forward flexion, this lower limit was not applicable.

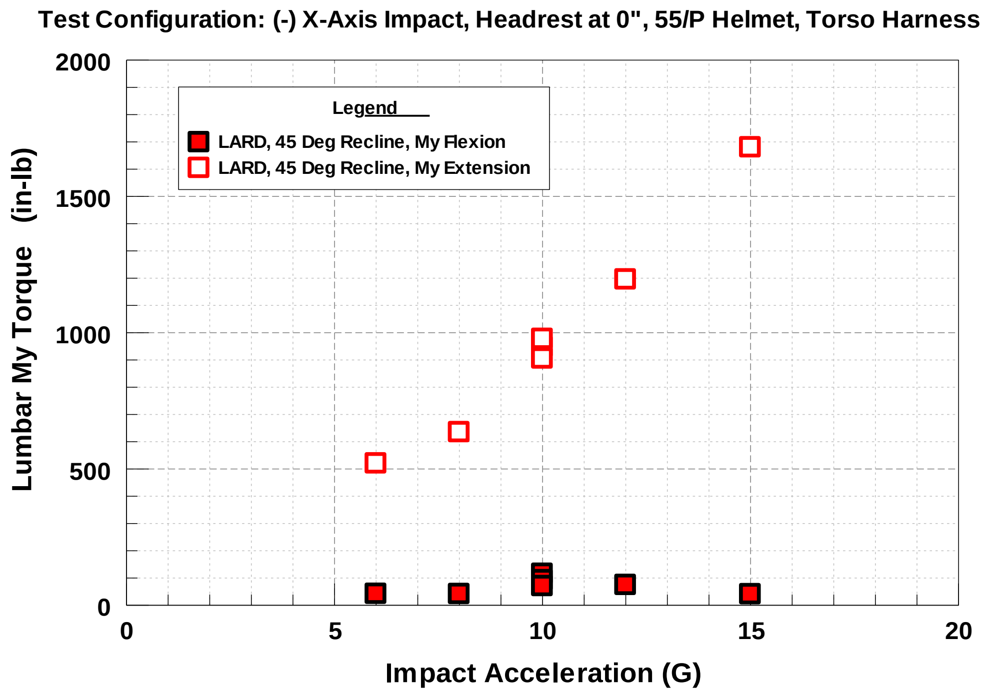


**Figure 33. LARD Lumbar My Torque as a Function of Impact Accel. and Seat Tilt**

## 7.3 Baseline II HIA Parametric Assessment: Reclined Seat

Baseline II comparative assessment was conducted with Test Cell S representing the baseline condition with the seat back in the reclined (45°) position, headrest in-line with the seat back, standard HGU-55/P helmet, and the standard torso harness. Comparisons were conducted based on headrest position variation, harness configuration variation, and operational ejection seat configuration variation.

### 7.3.1. Headrest Position with Reclined Seat

A comparative assessment of the data from Test Cell S and Test Cell T evaluated the effects of positioning the headrest forward 2. 5" from the baseline configuration defined as the headrest in-line (0" forward) with the reclined seat back. Data tables showing the response of the instrumented manikins as a function of impact level for specific measured variables are shown below.

The positive head Ry acceleration, neck tension, neck flexion, and resultant chest acceleration data values that were collected and calculated during impacts with the LOIS and LARD manikin,

are presented in Tables 25 through 28 to evaluate the effect of the headrest positioned forward. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 34 through 37.

**Table 25. Headrest Position Assessment with Reclined Seat: Head (+) Ry Accel. (Rad/S$^2$)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0" | HEADREST: 2.5" | HEADREST: 0" | HEADREST: 2.5" |
| 6 | 495 | 334 | 339 | 323 |
| 8 | 658 | 558 | 532 | 470 |
| 10 | 1099 ± 46 | 905 ± 10 | 774 ± 45 | 664 ± 51 |
| 12 | 1229 | 1313 | 1221 | 891 |
| 15 | 1886 | 1693 | 1705 | 1215 |

**Table 26. Headrest Position Assessment with Reclined Seat: Neck Tension (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0" | HEADREST: 2.5" | HEADREST: 0" | HEADREST: 2.5" |
| 6 | 42 | 42 | 41 | 68 |
| 8 | 90 | 109 | 92 | 109 |
| 10 | 143 ± 3 | 170 ± 6 | 118 ± 8 | 136 ± 2 |
| 12 | 194 | 250 | 129 | 149 |
| 15 | 254 | 337 | 141 | 209 |

Table 27. Headrest Position Assessment with Reclined Seat: Neck Flexion (in-lb)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0" | HEADREST: 2.5" | HEADREST: 0" | HEADREST: 2.5" |
| 6 | 283 | 229 | 155 | 147 |
| 8 | 350 | 298 | 202 | 192 |
| 10 | 436 ± 11 | 354 ± 9 | 250 ± 8 | 223 ± 2 |
| 12 | 437 | 407 | 273 | 243 |
| 15 | 514 | 512 | 302 | 272 |

Table 28. Headrest Position Assessment with Reclined Seat: Resultant Chest Accel. (G)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | HEADREST: 0" | HEADREST: 2.5" | HEADREST: 0" | HEADREST: 2.5" |
| 6 | 9.0 | 8.7 | 8.3 | 8.8 |
| 8 | 12.5 | 11.9 | 11.8 | 11.9 |
| 10 | 15.3 ± 0.14 | 15.3 ± 0.11 | 14.1 ± 0.9 | 14.7 ± 0.34 |
| 12 | 18.7 | 18.7 | 17.4 | 16.3 |
| 15 | 22.6 | 21.6 | 22.7 | 20.9 |

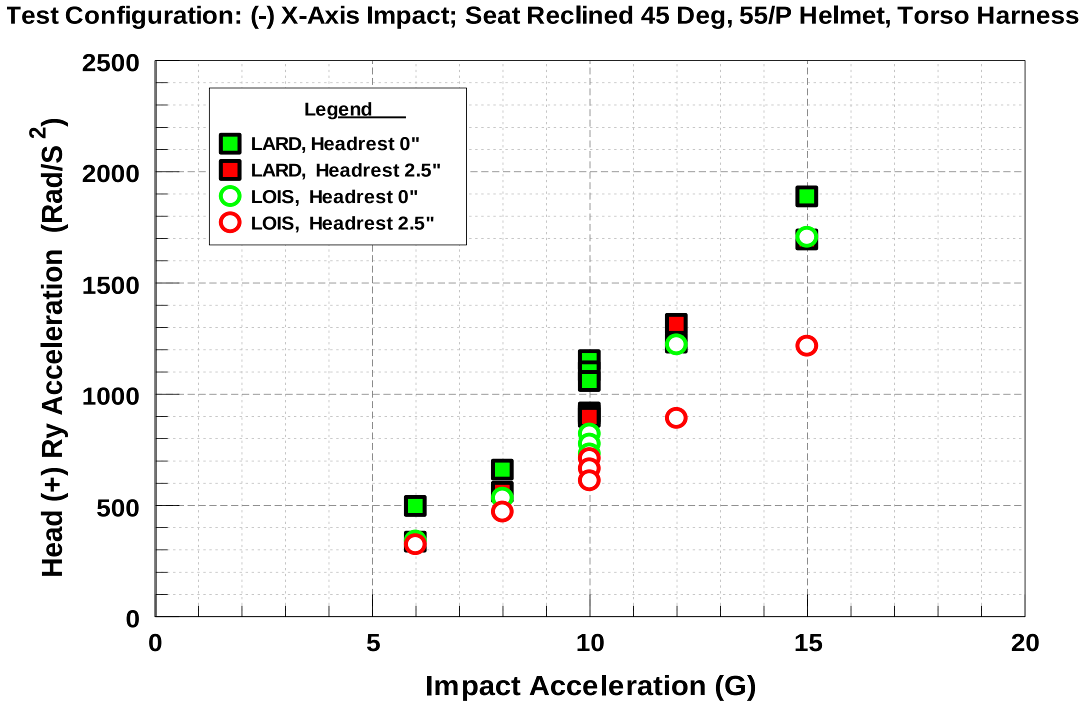


**Figure 34. Head (+) Ry Acceleration as a Function of Impact Accel. and Headrest Position With Reclined Seat**

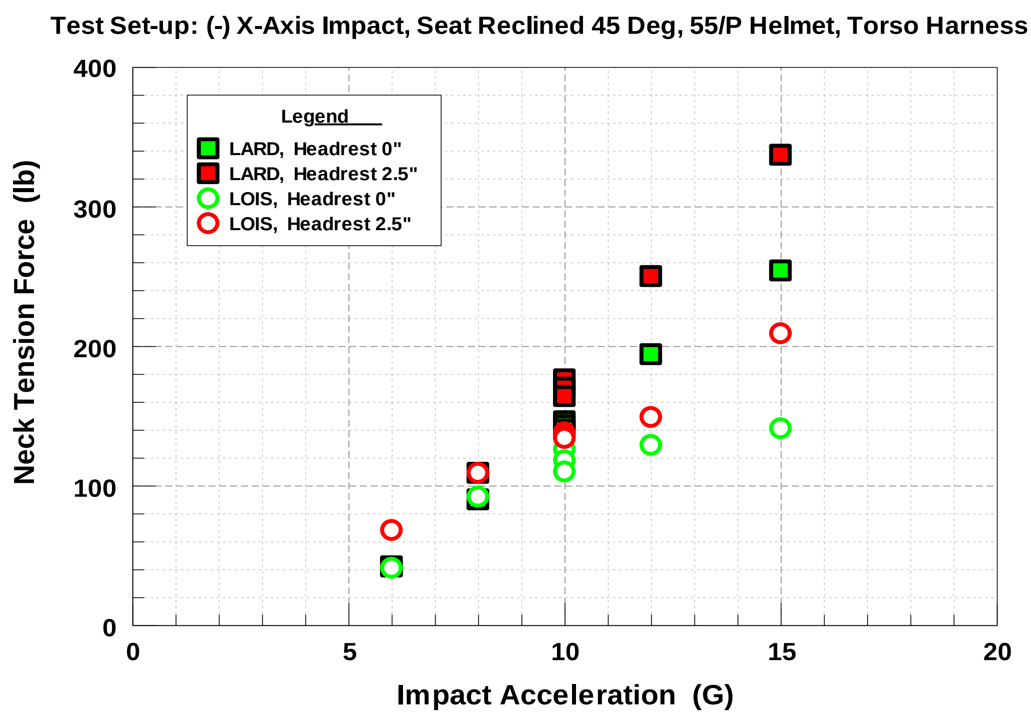


**Figure 35. Neck Tension Force as a Function of Impact Accel. and Headrest Position With Reclined Seat**

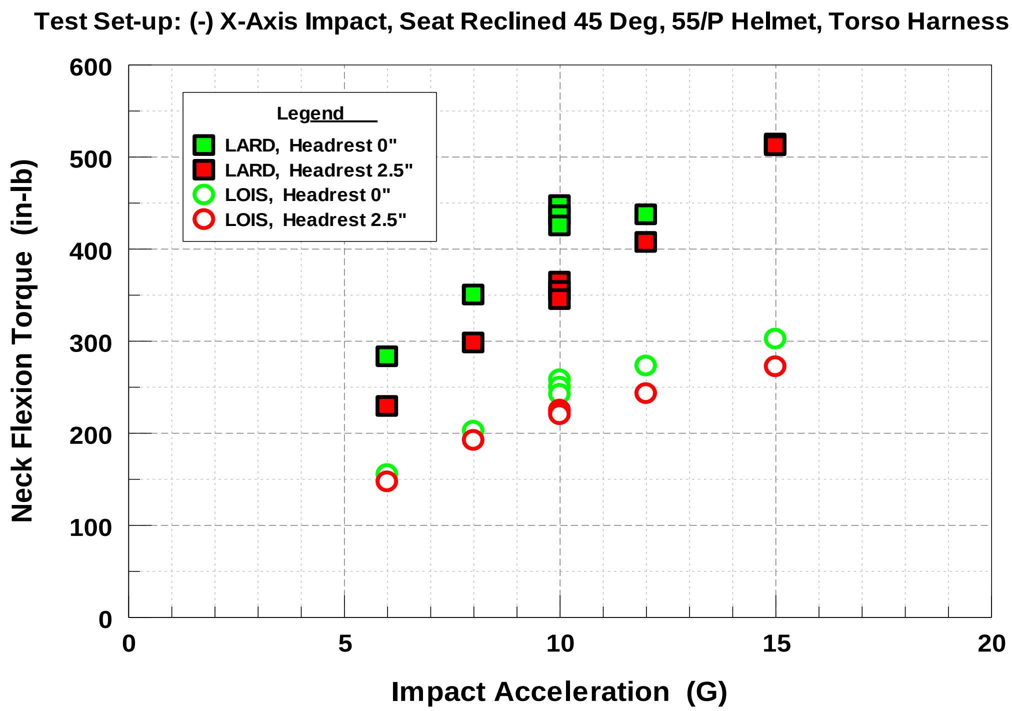


**Figure 36. Neck Flexion Torque as a Function of Impact Accel. and Headrest Position With Reclined Seat**

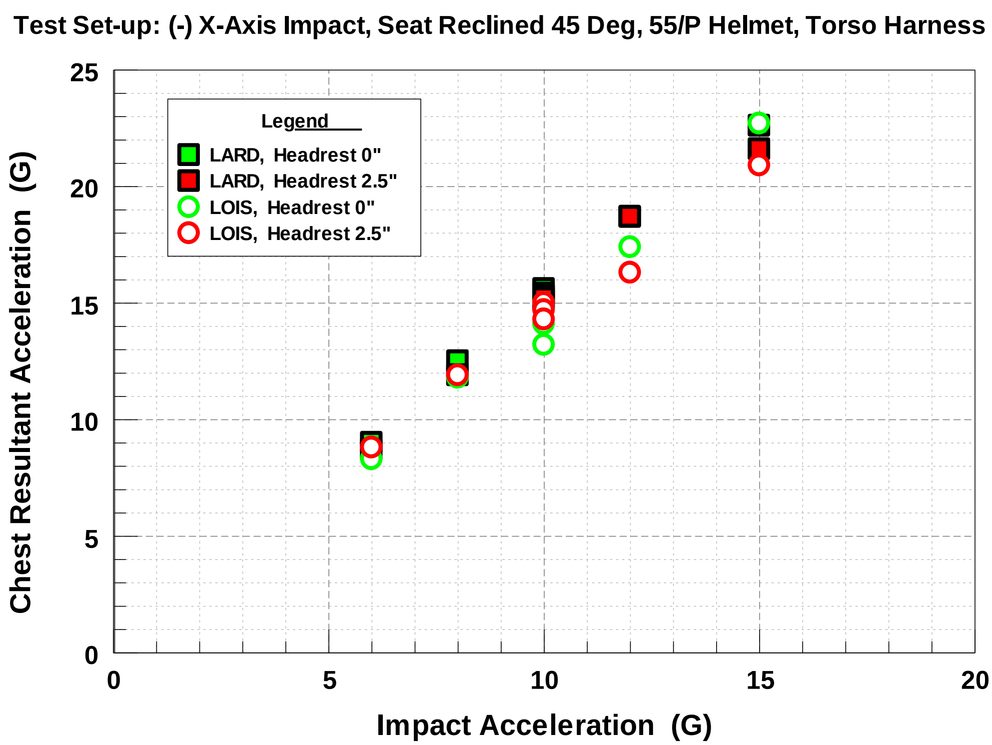


**Figure 37. Resultant Chest Accel. as a Function of Impact Accel. and Headrest Position With Reclined Seat**

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA impact configurations with the seat fixture reclined and defined in Table 1 for Cells S and T. The four analyzed data sets indicate the consistent trend to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins.

The headrest positioned 2.5” forward of the seat back had very little affect on neck flexion torque and chest acceleration when compared to the baseline position for both the LOIS and LARD manikins. The forward headrest position did cause the neck tension values to increase relative to the baseline headrest position, and this was true for both the LOIS and LARD manikins. The greatest relative increases in neck tension were demonstrated at 10, 12, and 15 G impact conditions. The forward headrest postion caused a slight decrease in the head Ry acceleration for LOIS but had minimal affect on the LARD. Overall, the LARD responses were greater than the LOIS responses for all the parameters except the chest acceleration where the data was very close throughout the range of acceleration levels. These data sets indicate that the headrest forward position did not increase biodynamic response compared to baseline data with the exception of the neck tension force.

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with a forward headrest during a drogue chute or main chute deployment with the seat reclined 45°. The LOIS and LARD Nij data indicated that neither the baseline condition nor the forward headrest condition while the seat was reclined generated Nij values in excess of the AFRL limit of 0.56. The 15 G impact with LOIS generated the largest Nij value of 0.27 with the foreward headrest configuration. The Neck Tension Force was also evaluated to provide an indication of the risk of neck injury, and the LARD manikin did not generate neck tension forces that exceeded the recommended AFRL Neck Tension force limits of 357 lbs. The LOIS manikin did generate a neck tension force of 209 lb, which exceeds the AFRL force limit of 186 lb, and would produce a neck injury risk of 8.4%.

### 7.3.2. Restraint Harness Configuration with Reclined Seat

A comparative assessment of the data from Test Cell S and Test Cell U evaluated the effects of using a seat mounted harness configuraiton compared to the baseline torso mounted harness with the seat in the reclined position. Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The neck tension force, resultant chest acceleration, lumbar compressive force, and Lumbar My flexion (positive My torque) data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 29 through 32. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 38 through 41.

**Table 29. Restraint Harness Assessment with Reclined Seat: Neck Tension Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 42 | 48 | 41 | 47 |
| 8 | 90 | 127 | 92 | 108 |
| 10 | 143 ± 3 | 208 ± 16 | 118 ± 8 | 129 ± 4 |
| 12 | 194 | 267 | 129 | 181 |
| 15 | 254 | 354 | 141 | 182 |

**Table 30. Restraint Harness Assessment with Reclined Seat: Resultant Chest Accel. (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 9.0 | 7.4 | 8.3 | 7.2 |
| 8 | 12.5 | 9.8 | 11.8 | 8.6 |
| 10 | 15.3 ± 0.14 | 12.8 ± 0.8 | 14.1 ± 0.9 | 11.3 ± 0.1 |
| 12 | 18.7 | 16.0 | 17.4 | 14.6 |
| 15 | 22.6 | 20.0 | 22.7 | 18.6 |

**Table 31. Restraint Harness Assessment with Reclined Seat: Lumbar Compression (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 720 | 739 | 361 | 354 |
| 8 | 962 | 912 | 481 | 451 |
| 10 | 1141 ± 11 | 1154 ± 14 | 597 ± 14 | 585 ± 4 |
| 12 | 1403 | 1425 | 714 | 697 |
| 15 | 1733 | 1718 | 872 | 863 |

**Table 32. Restraint Harness Assessment with Reclined Seat: Lumbar My Flexion (in-lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | TORSO HARNESS | SEAT HARNESS | TORSO HARNESS | SEAT HARNESS |
| 6 | 42 | 29 | 338 | 239 |
| 8 | 41 | 32 | 211 | 418 |
| 10 | 93 ± 25 | 80 ± 35 | 219 ± 73 | 453 ± 25 |
| 12 | 74 | 121 | 180 | 513 |
| 15 | 40 | 143 | 284 | 334 |

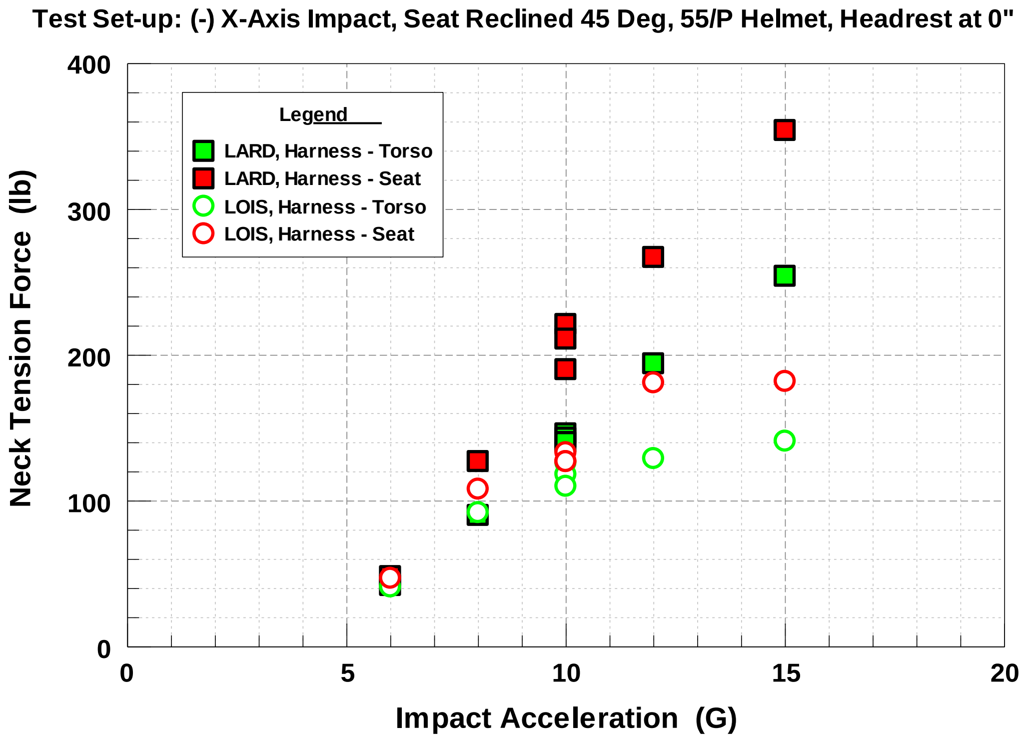


**Figure 38. Neck Tension Force as a Function of Impact Accel. and Restraint Harness with Reclined Seat**

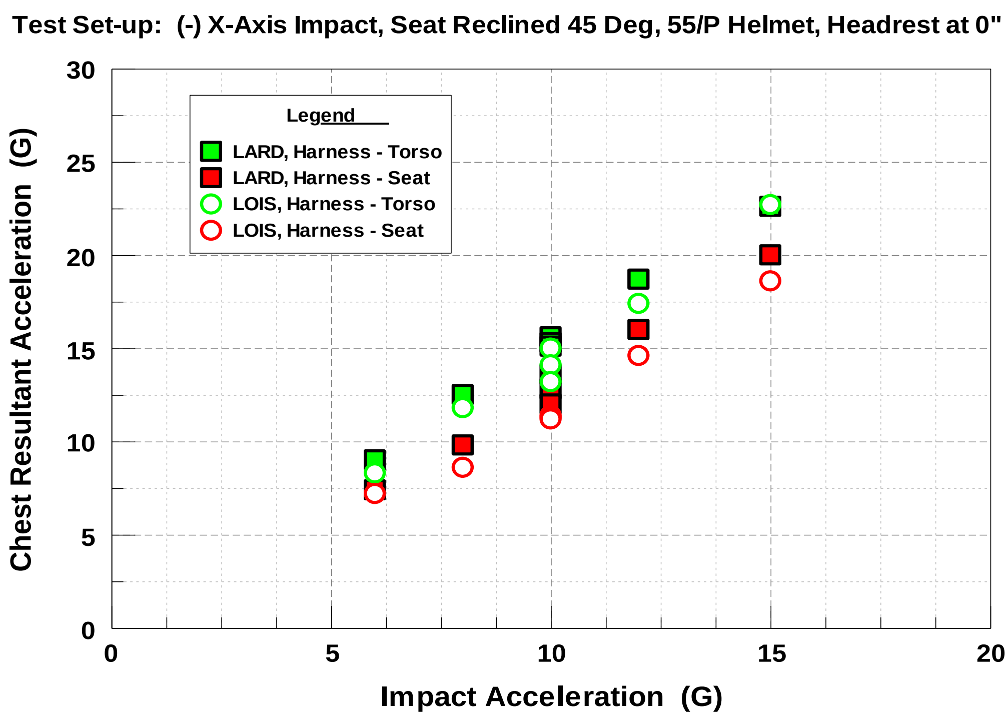


**Figure 39. Resultant Chest Accel. as a Function of Impact Accel. and Restraint Harness with Reclined Seat**

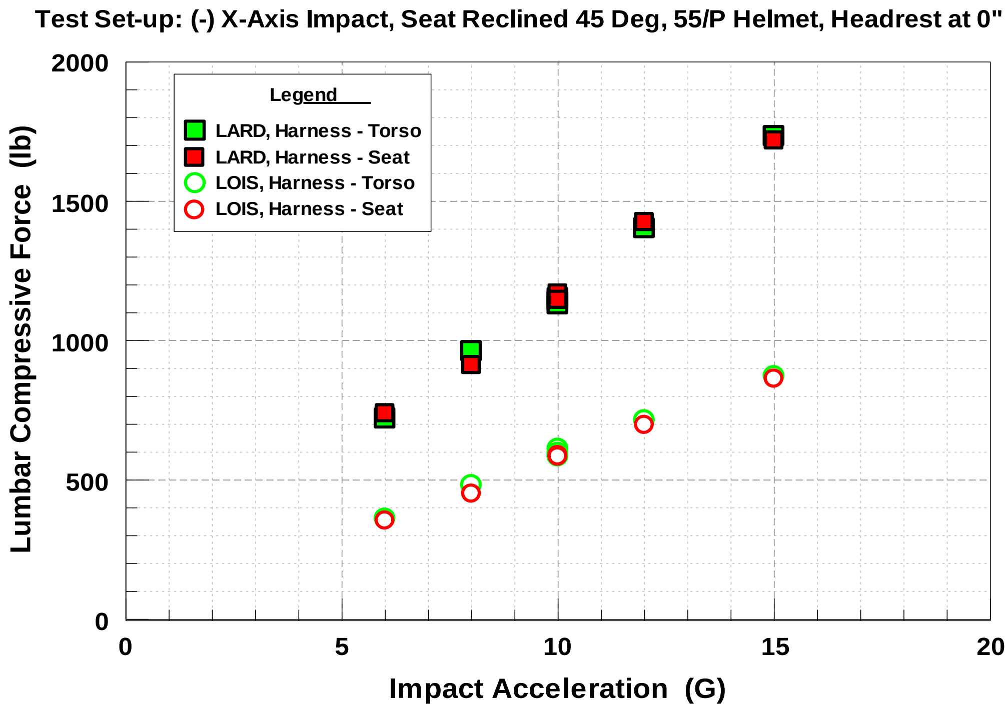


**Figure 40. Lumbar Compression as a Function of Impact Accel. and Restraint Harness with Reclined Seat**

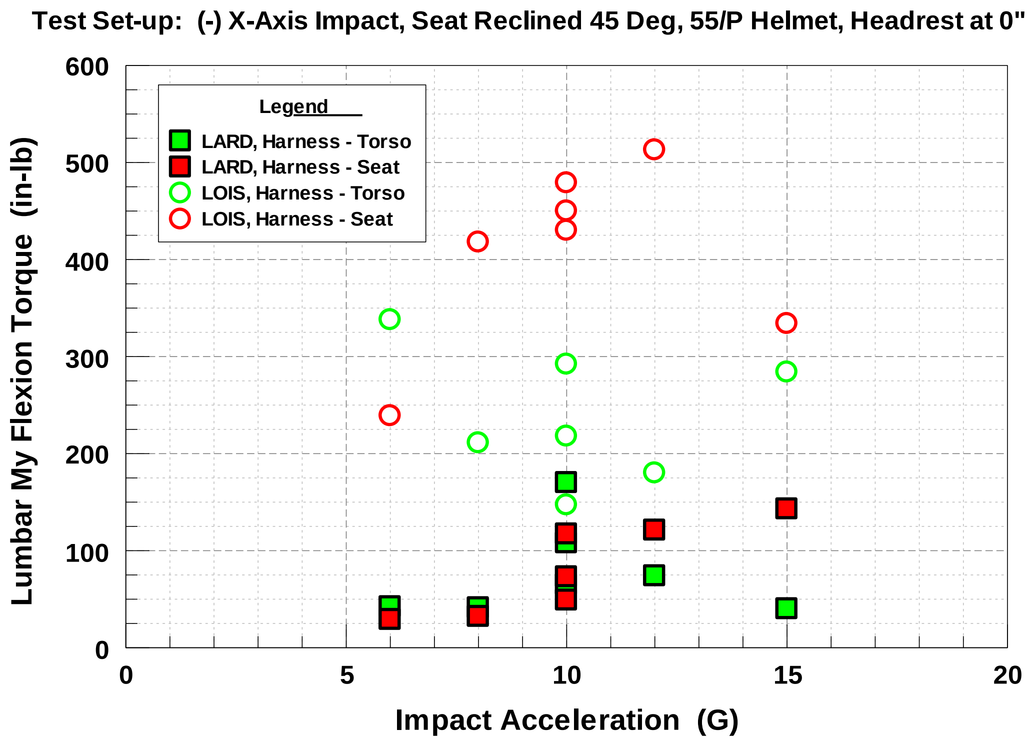


**Figure 41. Lumbar My Flexion as a Function of Impact Accel. and Restraint Harness with Reclined Seat**

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA impact configurations defined in Table 1 for Cells S and U. The analyzed data sets indicate the consistent trend to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins. The exception to this was the lumbar My flexion for both manikins which showed an inconsistent trend as a function of increasing impact acceleration.

The seat-mounted harness had minimal affect on the chest acceleration and the lumbar force for both manikins as compared to the baseline torso harness although the chest acceleration was slightly greater across the impact accelerations for the baseline torso harness. The LARD generated greater responses relative to the LOIS response for neck tension force, chest accleration and lumbar forces. The neck tension force and lumbar forces were greater for the LARD compared to the LOIS for both harness configurations. The neck tension force for LOIS and LARD manikins was greater with the seat-mounted harness compared to the torso harness with the seat harness generating 30% and 40% greater forces at 15 G respectively. The lumbar My flexion data was very inconsistent with both manikins and with both harness configurations and demonstrated no noticable trend as the impact acceleration increased. The LOIS My flexion was greater with the seat harness compared to the torso harness across the acceleration levels tested. The LARD My flexion was slightly lower for the seat harness at impact accelerations from 6 to 10 G, but much higher than the torso harness at 12 and 15 G impact accelerations. It should be noted that the LARD's negative My torque values (lumbar My extension) were much greater than the My flexion values and increased with increasing impact acceleration, while the LOIS My extension values were less than the flexion values, and as with the flexion, demonstrated no noticable trend as the impact acceleration increased. The My extension values are shown in Figure 42 for both manikins. The My extension data indicates that both harnesses would appear to be causing loads to be generated in the dorsal aspect of the manikin lumbar spine (spinous and transverse processes for human spine) for a larger occupant as compared to a smaller occupant.

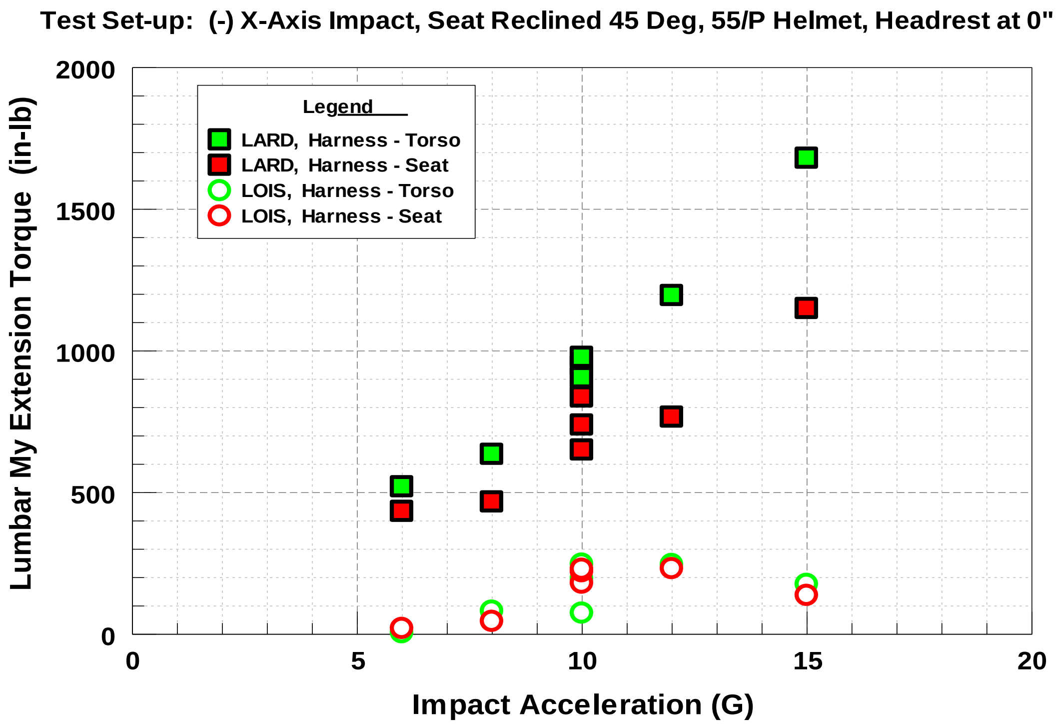


**Figure 42. Lumbar My Extension as a Function of Impact Accel. and Restraint Harness with Reclined Seat**

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with a forward headrest during a drogue chute or main chute deployment with the seat reclined 45°. The Nij data indicated that neither the torso or seat-mounted harness with a reclined seat generated Nij values in excess of the AFRL limit of 0.56. The 12 and 15 G impact accelerations with LOIS in the seat-mounted harness generated the largest Nij values of 0.42 and 0.41 respectively, but both were below the 5% risk of an AIS 2 injury.

The Neck Tension Force was also evaluated to provide an indication of the risk of neck injury, and the LOIS and LARD manikins did not generate neck tension forces that exceeded the recommended AFRL Neck Tension force limits of 186 lb and 357 lb respectively.

The lumbar compressive force was also evaluated to provide an indication of the risk of spinal injury. The LOIS manikin did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limit of 933 lb with either harness, but both harness configurations exceeded the limit of 653 lb with lumbar flexion at the 12 and 15 G impact levels. The LARD manikin did not generate lumbar compressive forces greateer than the AFRL Lumbar Compression Force limit of 1757 lb, but both harness configurations did exceed the limit of 1230 lb with lumbar flexion at the 12 and 15 G impact levels.

### 7.3.3. Simulated Ejection Seat Configuration with Reclined Seat

A comparative assessment of the data from Test Cell S and Test Cell W evaluated the effects of a JSF-style ejection seat configuration compared to a baseline USAF-style ejection seat configuration with each seat reclined 45° from the vertical. The baseline ejection seat configuration was defined as in-line headrest (0"), HGU-55/P helmet, and torso harness. The JSF-style ejection seat configuration was defined as forward headrest (2.5"), JSF Gen II mock-up helmet, and SCH harness (seat-mounted). Data tables and plots showing the response of the instrumented manikins as a function of impact level for specific measured variables were developed and assessed.

The neck tension force, resultant chest acceleration, lumbar compressive force, and Lumbar My flexion (positive My torque) data that were collected and calculated during impacts with the LOIS and LARD manikin, are presented in Tables 33 through 36. The data is shown in the tables as a function of progressively increasing impact accelerations, and represents the maximum value for the given parameter. The 10 G data sets show the average maximum value with standard deviation based on the multiple impacts at that condition. The data was also plotted as a function of increasing impact acceleration for each of the 4 assessed parameters, and are shown in Figures 43 through 46.

**Table 33. Simulated Ejection Seat, Reclined: Neck Tension Force (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | BASELINE | JSF-STYLE | BASELINE | JSF-STYLE |
| 6 | 42.3 | 76.6 | 41.1 | 84.8 |
| 8 | 90.4 | 160 | 92.0 | 151 |
| 10 | 143 ± 3.2 | 238 ± 7.6 | 118 ± 8.3 | 187 ± 7.0 |
| 12 | 194 | 335 | 129 | 227 |
| 15 | 254 | 373 | 141 | 248 |

**Table 34. Simulated Ejection Seat, Reclined: Resultant Chest Accel. (G)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | BASELINE | JSF-STYLE | BASELINE | JSF-STYLE |
| 6 | 9.0 | 7.2 | 8.3 | 7.6 |
| 8 | 12.5 | 9.9 | 11.8 | 7.9 |
| 10 | 15.3 ± 0.1 | 12.8 ± 0.7 | 14.1 ± 0.9 | 12.3 ± 0.2 |
| 12 | 18.7 | 17.3 | 17.4 | 15.4 |
| 15 | 22.6 | 18.8 | 22.7 | 19.4 |

**Table 35. Simulated Ejection Seat, Reclined: Lumbar Compression (lb)**

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | BASELINE | JSF-STYLE | BASELINE | JSF-STYLE |
| 6 | 720 | 610 | 361 | 358 |
| 8 | 962 | 793 | 481 | 457 |
| 10 | 1141 ± 11 | 987 ± 7.9 | 597 ± 14 | 544 ± 6.6 |
| 12 | 1403 | 1195 | 714 | 693 |
| 15 | 1733 | 1436 | 872 | 857 |

Table 36. Simulated Ejection Seat, Reclined: Lumbar My Flexion (in-lb)

| IMPACT ACCELERATION (G) | LARD | | LOIS | |
|---|---|---|---|---|
| | BASELINE | JSF-STYLE | BASELINE | JSF-STYLE |
| 6 | 42 | 34.0 | 338 | 218 |
| 8 | 41 | 30.0 | 211 | 221 |
| 10 | 93 ± 25 | 80.7 ± 0.6 | 219 ± 73 | 242 ± 64 |
| 12 | 74 | 45 | 180 | 250 |
| 15 | 40 | 17 | 284 | 236 |

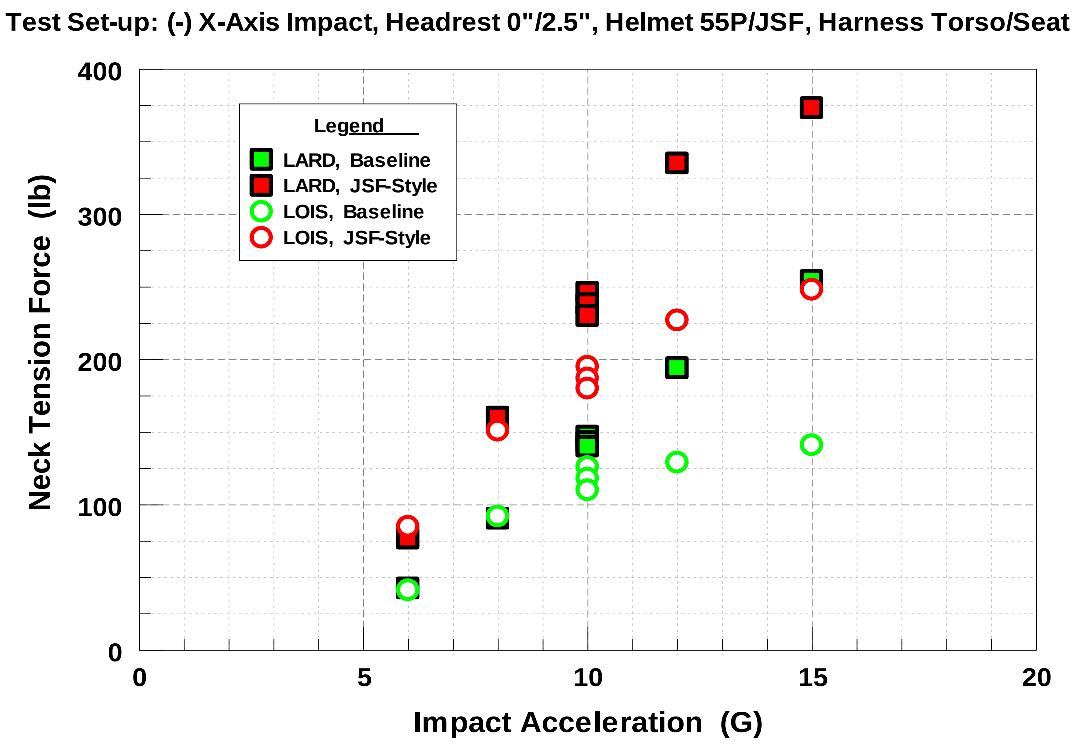


Figure 43. Neck Tension Force as a Function of Impact Accel. and Reclined Simulated Ejection Seat

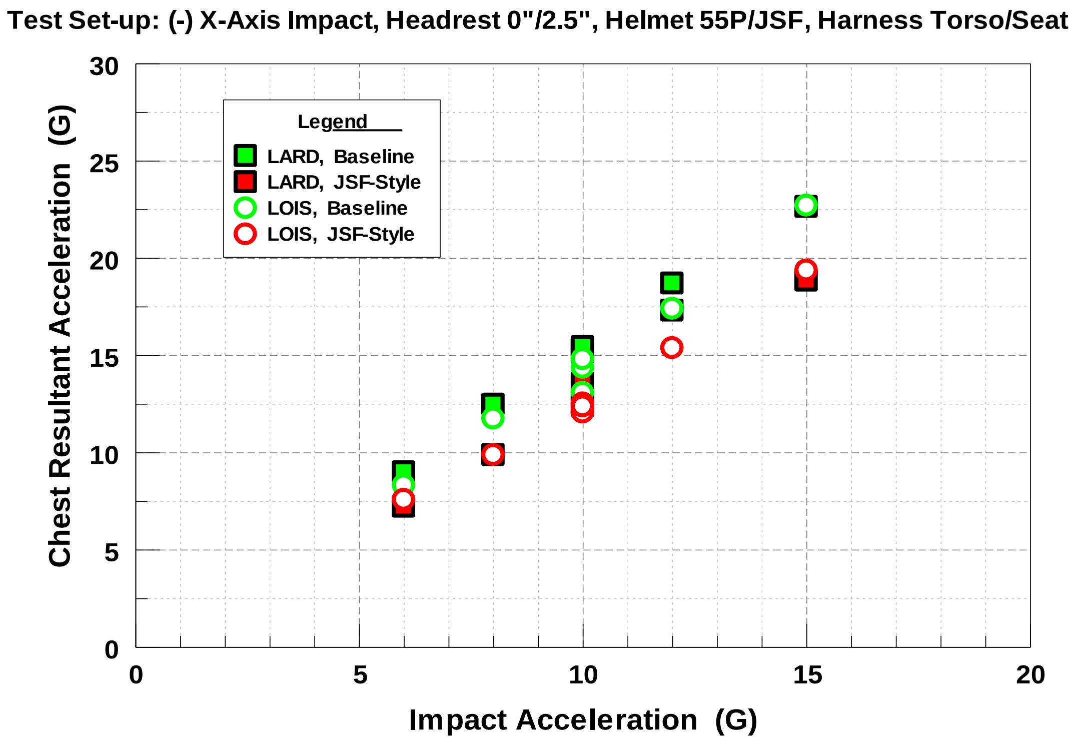


**Figure 44. Resultant Chest Accel. as a Function of Impact Accel. and Reclined Simulated Ejection Seat**

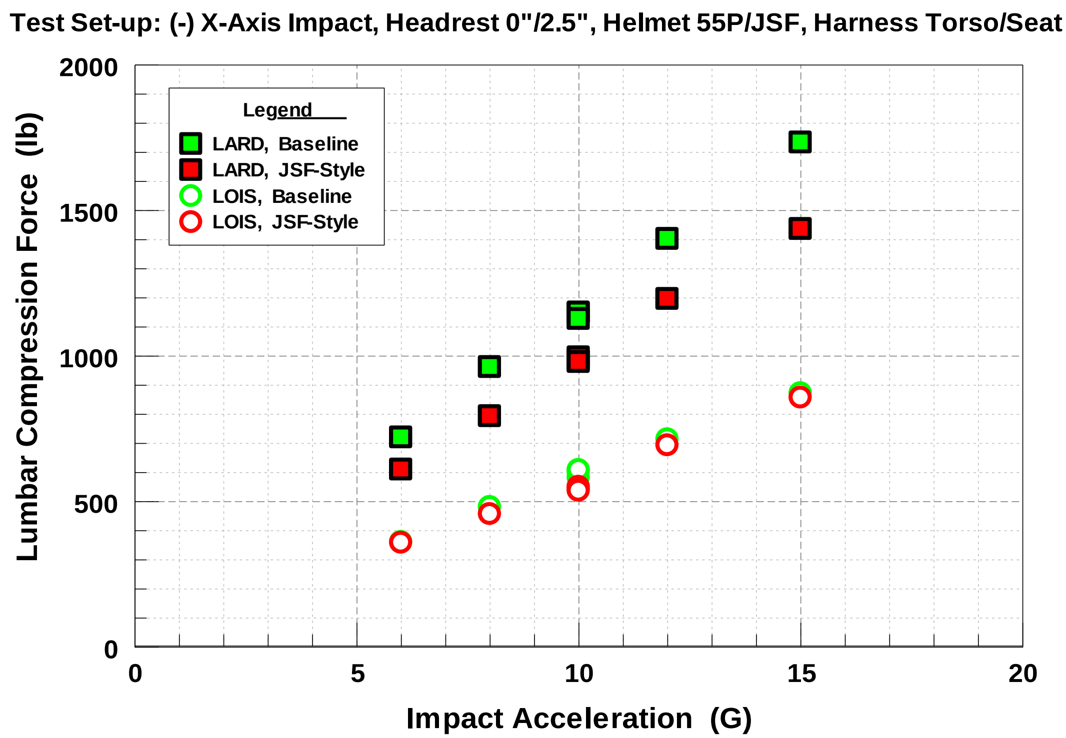


**Figure 45. Lumbar Compression as a Function of Impact Accel. and Reclined Simulated Ejection Seat**

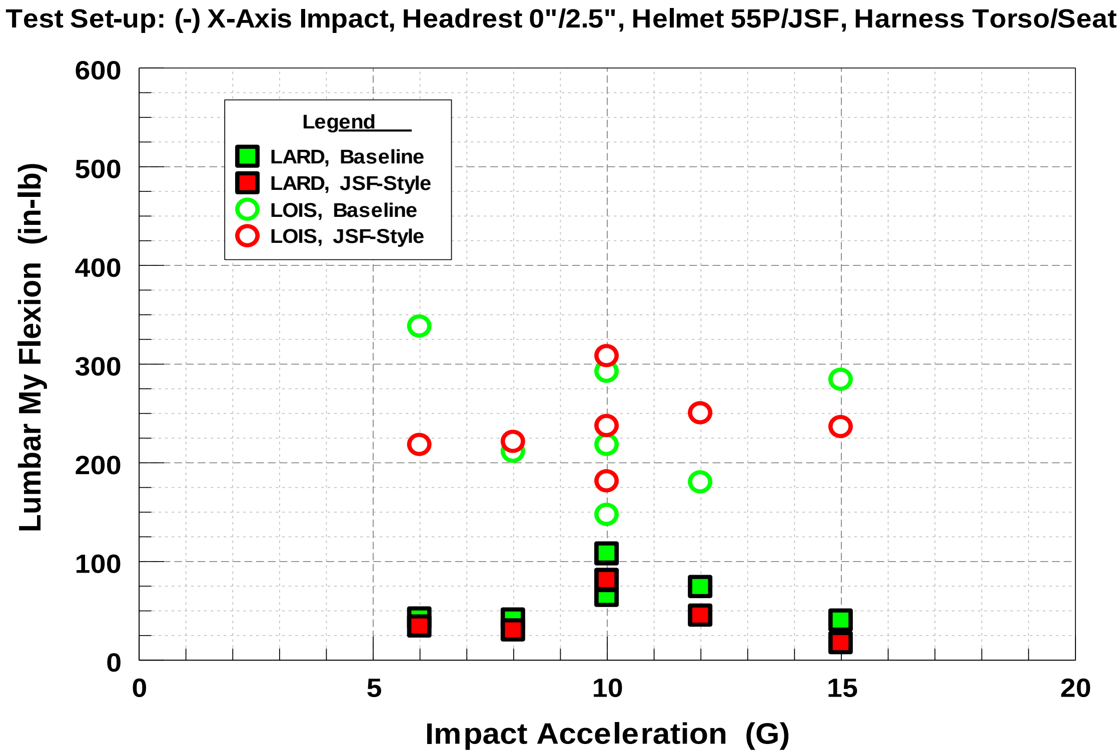


**Figure 46. Lumbar My Flexion as a Function of Impact Accel. and Reclined Simulated Ejection Seat**

Testing was successfully completed at all the impact accelerations (6, 8, 10, 12 and 15 G) for all the HIA impact configurations defined in Table 1 for Cells S and W. The analyzed data sets indicate the consistent trend for manikin accelerations and forces to increase as a function of impact acceleration for both the LOIS and LARD manikins, and in general follow a linear relationship which is consistent with the previous research with both manikins. The exception to this was the lumbar My flexion for both manikins.

The JSF-Style ejection seat configuration had minimal affect on the chest acceleration and the lumbar force for both manikins as compared to the baseline seat although the LARD lumbar force was slightly greater at all impact accelerations for the baseline seat configuration. The LARD generated greater responses relative to the LOIS response for neck tension force, chest accleration and lumbar forces. The neck tension force and lumbar forces were greater for the LARD compared to the LOIS for both seat configurations. The neck tension force for LOIS and LARD manikins was greater with the JSF-Style seat compared to the baseline seat with the JSF-Style seat generating approximately 50% and greater forces at the 10 G, 12 G, and 15 G impact accelerations. The lumbar My flexion data was very inconsistent with both manikins and with both seat configurations and demonstrated no noticable trend as the impact acceleration increased. The LOIS My flexion was greater than the LARD My flexion across the acceleration levels tested independent of the seat configuration. It should be noted that the LARD's negative My torque values (lumbar My extension) were much greater than the My flexion values, and

increased with increasing impact acceleration, and the LOIS My extension values were less than the flexion values, and demonstrated no noticable trend as the impact acceleration increased. The My extension values are shown in Figure 47for both manikins and indicates that both seat configuraions would appear to be loading the dorsal aspect of the manikin lumbar spine (spinous and transverse processes for human spine) for a larger occupant as compared to a smaller occupant.

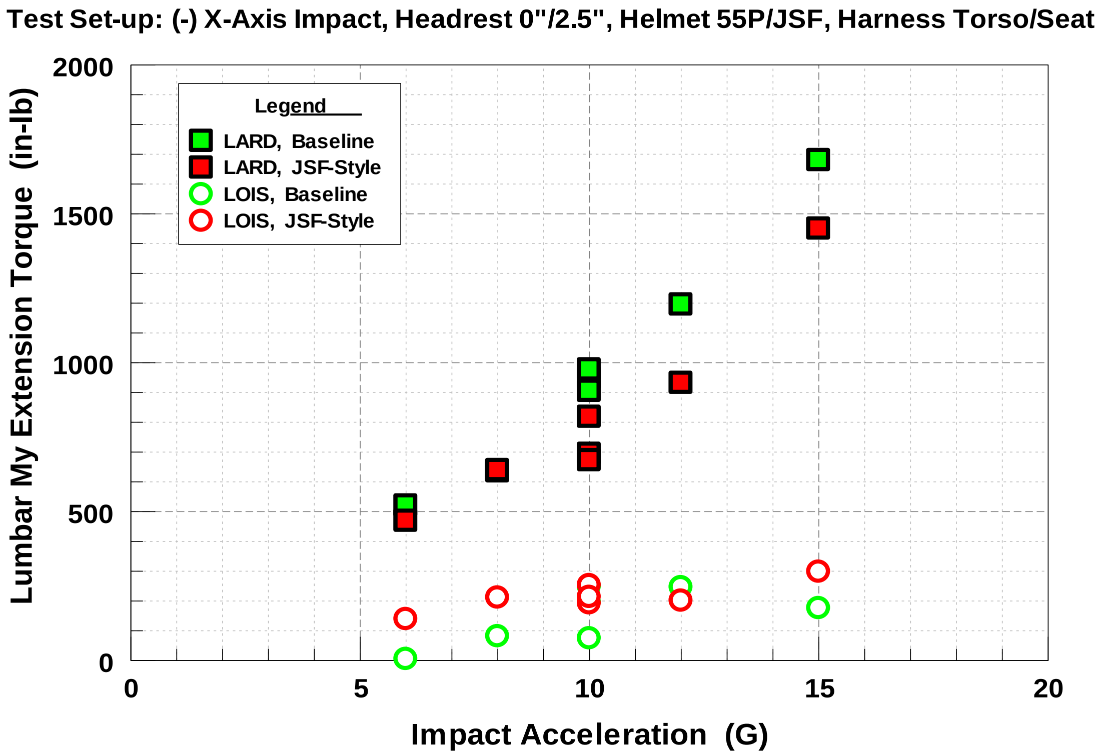


**Figure 47. Lumbar My Extension as a Function of Impact Accel. and Reclined Simulated Ejection Seat**

The Nij was calculated to provide an indication of the associated risk of neck injury to the occupant with a forward headrest during a drogue chute or main chute deployment with the seat reclined 45°. The data indicated that Nij values for neither the JSF-Style seat nor the USAF-style baseline seat in a reclined position exceeded the AFRL limit of 0.56. The 12 G and 15 G impact accelerations with LOIS in the JSF-Style seats generated the largest Nij values in the group with values of 0.43 and 0.47 respectively, but both resulted in probability of injury values below 5% at the AIS 2 level.

The Neck Tension Force was also evaluated to provide an indication of the risk of neck injury. The LOIS generated neck tension forces at the 12 and 15 G impact level, with the JSF-Style seat, that exceeded the AFRL Neck Tension force limit of 186 lb, with values of 227 lb at 12 G and 248 lb at 15 G, for a probability of injury equal to 12.2% and 18.4% respectively. The LARD generated neck tension forces at 15 G, with the JSF-Style seat, that exceeded the recommended

AFRL Neck Tension force limits of 357 lb, with a value of 373 lb for a probability of injury equal to 6.0%. It should also be noted that the LOIS did produce a neck tension at 10 G that would result in a probability of injury of approximately 5%.

The lumbar compressive force was also evaluated to provide an indication of the risk of spinal injury. The LOIS manikin did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limit of 933 lb at any impact acceleration with either harness, but both harness configurations with the LOIS exceeded the limit of 653 lb with lumbar flexion at the 12 and 15 G impact levels. The LARD manikin did not generate lumbar compressive forces greater than the AFRL Lumbar Compression Force limit of 1757 lb, but both harness configurations with the LARD did exceed the limit of 1230 lb with lumbar flexion at the 12 and 15 G impact levels.

## 8.0 SUMMARY AND CONCLUSIONS

Research was conducted involving a series of (-) x-axis impact tests conducted on the HIA. The primary purpose of the research was to conduct a comparative assessment of seat and torso mounted restraint systems during the simulated drogue and parachute-opening phase of an aircraft ejection. The comparative assessment evolved into a parametric analysis that also included peak horizontal impact acceleration, seat headrest position relative to seatback tangent plane, and head supported mass (helmet system). A LOIS and a LARD instrumented manikin were used in this test program to simulate human response. This research effort was the second of a two phase effort where the first phase was previously conducted with a similar parametric analysis but in a vertical impact environment.

The experimental design consisted of a specially designed test matrix developed to address the program requirement to conduct a parametric assessment of manikin response during a horizontal impact simulating the different phases of an aircraft ejection following seat/rail seperation. The main parameters where the restraint system, the head rest position, and the worn helmet system. The variable restraint system was either the baseline torso-mounted restraint harness or the seat-mounted restraint harness (Simplified Combined Harness or SCH). The variable headrest position was either the baseline 0" position (headrest in-line with the seat back) or the headrest 2.5" forward of the seat back. The variable helmet system was either the baseline HGU-55/P helmet plus mask (≈ 3 lb) or the JSF Gen II mock-up helmet plus mask (≈ 5 lb). The analysis consisted of a comparative assessment of each parameter relative to a baseline configuration, with a final analysis combining all the baseline configurations and non-baseline configurations into resulting baseline seat configuration and a non-baseline seat configuration. Analysis consisted of using both measured data from each manikin (loads and accelerations), and calculated data from each manikin (Nij), and determining data trends for specific data sets, and injury risks using lumbar and neck load data. The initial data analysis had the generic seat fixture in an upright (seat pan horizontal) position which was identified as Baseline I comparisons. A second series of baseline/non-baseline configuration comparisons was also made with the seat reclined 45°, and was identifed as Baseline II comparisons.

Data from the first Baseline I comparison involved the variable headrest position with the baseline headrest in-line with the seat back at 0" and the non-baseline headrest 2.5" forward of the seat back. The headrest positioned 2.5" forward of the seat back had very little affect on the head Ry angular acceleration, neck tension, neck flexion, and chest acceleration when compared to the baseline position. This was true for both the LOIS and LARD manikins. These data sets indicate that the headrest forward position did not increase forward motion of the head and torso compared to baseline position, and is most likely due to the initial position of the neck in both manikins allowing minimal if any contact between the headrest and the helmet at the start of the impact. Neither manikin generated data that caused failure of the Nij neck injury criteria or the the AFRL neck tension criteria.

Data from the second Baseline I comparison involved the variable helmet system with the baseline helmet system consisting of the HGU-55/P helmet plus mask and the non-baseline helmet system consisting of the JSF Gen II mock-up helmet plus mask. The heavy 5 lb helmet system had a greater affect on the neck tension, and chest acceleration for the LOIS manikin than

the LARD manikin with a percent difference relative to the baseline helmet at 15 G for LOIS greater than 75% for both the neck tension force and the chest acceleration. Similar results were found by Perry et al (2004) and Buhrman et al (2016). The LARD manikin responses with the heavy helmet were comparable to the baseline responses at the lower impact levels, but at 10 G and above the responses were slightly greater. The LOIS manikin generated an Nij value in both tension/flexion and tension/extension with the heavy helmet that equaled/exceeded the Nij limit of 0.56 at the 15 G impact level. The LOIS manikin also generated neck tension forces that exceeded the recommended AFRL Neck Tension force limit of 186 lb with the heavy helmet at the 10, 12, and 15 G impact levels, with the 15 G test producing a 71% risk of neck injury which was the highest for the program.

Data from the third Baseline I comparison involved the restraint harness configuration with the baseline harness consisting of the USAF torso harness, and the non-baseline harness consisting of the SCH or seat-mounted harness. The LARD manikin generated greater responses relative to the LOIS manikin response for neck tension load and chest acceleration. The seat-mounted harness had minimal affect on the neck tension load and the chest acceleration for both manikins, although the data was slightly greater for the seat-mounted harness for both parameters for the LARD. The LOIS and LARD did not generate a Nij neck risk or neck tension force greater than the AFRL limits for either harness. The seat-mounted harness with the LOIS produced slightly larger lumbar compressive forces at all impact accleration levels, and slighly lower lumbar My flexion moments at higher input accelerations. The LARD did generate lumbar compression loads at 15 G that exceeded the AFRL limit, and also generated Lumbar My extension moments that were significantly times greater then the respective Lumbar My flexion moment values. This indicates that that both harness configurations are causing the LARD's upper torso to translate forward relative to a forward pelvis roll (generating greater dorsal lumbar spine loading), with the seat mounted harness genreating the largest extension moments.

Data from the fourth Baseline I comparison involved a simulated ejection seat configuration with the baseline ejection seat defined as inline headrest (0"), HGU-55/P helmet, and torso harness, and the non-baseline JSF-style ejection seat defined as forward headrest (2.5"), JSF Gen II mock-up helmet, and SCH harness (seat-mounted). The JSF-style ejection seat configuration generted noticable increses in the neck tension force and the chest acceleration for both manikins as compared to the baseline seat configuration. The neck tension force increased approximately 50% as compared to the baseline configuration for both the LOIS and LARD manikin across the impact acceleration levels. The LARD manikin did not generate a Nij neck risk greater thant the AFRL limit, but the LOIS manikin in the JSF-style seat did generate an Nij value of 0.62 at the 15 G impact level which exceeded the AFRL limit of 0.56. The LOIS and LARD manikin both generated neck tension forces that exceeded the recommended AFRL Neck Tension Force limit of 186 lb and 357 lb respectively at impacts greater than 10 G. The JSF-style seat configuration generated slightly greater lumbar compressive force and lumbar My flexion values for the LOIS manikin compared to the baseline, but this was reversed for the LARD manikin. The LOIS and LARD manikin generated lumbar loads that did not exceed the recommended AFRL Lumbar Load Compression limits. As with the previous comparison between the harness configurations, the LARD manikin's negative My torque values (lumbar My extension) were significantly greater than the positive values at each impact level.

Data from the fifth Baseline I comparison involved the seat tilt position with the baseline configuration defined as inline headrest (0"), HGU-55/P helmet, torso harness, and seat fixture upright in the vertical or 0° position, and the reclined seat configuration defined as inline headrest (0"), HGU-55/P helmet, torso harness, and seat fixture reclined backwards 45°. The reclined seat configuration decreased the neck tension force and increased the chest acceleration for LOIS as compared to the baseline seat configuration. However, the LOIS and LARD manikin did not generated Nij or neck tension forces that exceeded the recommended AFRL limits. The reclined seat configuration generated significantly greater lumbar compressive force values for both the LOIS and LARD manikins compared to the baseline seat, however, the lumbar loads did not exceed the recommended AFRL Lumbar Load Compression limits. As with the previous comparion with the harness configurations, the LARD manikin's negative My torque values (lumbar My extension) were 2-3 times greater than the positive values at each impact level.

Data from the first Baseline II comparison with the seat reclined 45° involved the variable headrest position with the baseline headrest in-line with the seat back at 0" and the non-baseline headrest 2.5" forward of the seat back. The headrest positioned 2.5" forward of the seat back had minor affects on the chest acceleration when compared to the baseline position for both the LOIS and LARD manikins. However, the head Ry acceleration was decreased for LOIS, and the neck tension force was increased for both manikins. The LOIS and the LARD did not generate Nij values that exceeded the AFRL limits, however, LOIS did generate neck tension with the forward headrest that exceed the AFRL limit at the 15 G impact level. These data sets indicate that the headrest forward position did not significantly increase forward motion of the head and torso compared to baseline position, and is most likely due to the initial position of the neck in both manikins allowing minimal if any contact between the headrest and the helmet at the start of the impact.

Data from the second Baseline II comparison with the seat reclined 45° involved the restraint harness configuration with the baseline harness consisting of the USAF torso harness, and the non-baseline harness consisting of the SCH or seat-mounted harness. The LARD manikin generated greater responses relative to the LOIS manikin response for neck tension load and chest acceleration. The seat-mounted harness generated higher neck tension and lower chest accelerations for both manikins. The LOIS and LARD did not generate Nij neck risk values greater than the AFRL limits for either harness, and they did not generate neck tension values greater than the AFRL limits for either harness. The seat-mounted harness produced similar lumbar compressive forces compared to the torso harness for both manikins, and higher lumbar positive My torques in the LOIS at impact accelerations of 10 G and above. The LARD generated negative Lumbar My extension that were 2 to 3 times greater than the respective Lumbar My flexion. The seat mounted harness generated a greater risk of spinal injury for both manikins based on lumbar compression limits with combined lumbar flexion.

Data from the third Baseline II comparison with the seat reclined 45° involved a simulated ejection seat configuration with the baseline ejection seat defined as inline headrest (0"), HGU-55/P helmet, and torso harness, and the non-baseline JSF-style ejection seat defined as forward headrest (2.5"), JSF Gen II mock-up helmet, and SCH harness (seat-mounted). The JSF-Style ejection seat configuration increased neck tension, decreased chest acceleration, and decreased

lumbar compression for both manikins as compared to the baseline seat although the LOIS lumbar force was only slightly lower than the baseline seat configuration. The LARD generated greater responses relative to the LOIS response for neck tension force, chest accleration and lumbar forces. The neck tension force and lumbar forces were greater for the LARD compared to the LOIS for both seat configurations, and both forces were greater for the JSF-style seat. The LOIS and LARD did not generate Nij values that exceeded the AFRL limits for either seat configuration; however, they did generate neck tension forces at the 12 and 15 G impact level with the JSF-Style seat that exceeded the recommended AFRL Neck Tension force limits. The LOIS and LARD did not generate lumbar compressive forces that exceeded the AFRL limit; however, the LOIS exceeded the lumbar compression limit with combined lumbar flexion at 12 G and 15 G impact accelerations. . The lumbar My flexion data was very inconsistent with both manikins and with both seat configurations and demonstrated no noticable trend as the impact acceleration increased, however, the LARD's negative My torque values (lumbar My extension) were much greater than the My flexion values, and increased with increasing impact acceleration.

Overall, the series of comparative assessments indicated that a forward headrest of 2.5" relative to the seat back had minimal effect on the biodynamics response regardless of seat tilt position. The heavy helmet of 5 lb with a forward cg shift generated greater biodynamic responses for both the LOIS and the LARD manikin with the LOIS Nij and neck tension values exceeding the AFRL limits. The comparative assessment with the SCH or seat-mounted harness indicated that this configuration with no seat tilt had minimal effect on biodynamic neck and chest response but reduced the lumbar spine responses for both manikins; however, with the seat reclined, the SCH increased neck tension and lumbar flexion for both manikins. The simulated JSF-style ejection seat generated greater biodynamic response in the neck for both LOIS and LARD at both seat tilt configurations, and generated greater biodynamic response for the LOIS in the lumbar spine with the upright seat configuration.

All the data sets collected for this effort will be used in a future human impact study with similar comparative assessments for prediction of biodynamic response at acceleration levels beyond what is allowed for human test subjects. Assessment of new DRI limits will be conducted at the completion of the human phase of testing.

The following should be highlighted concerning response characteristics of the manikins during this effort that have not been noted during previous impact programs.

(1) The LOIS neck response during the –Gx testing indicated a tendency to have the Neck My peak extension occur before the flexion, and it was consistantly the dominant response particularly when a heavy helmet was worn. This tendency was independent of the tilt of the seat based on the data collected during this study. It is not clear at this point whether this was due to the headform interface with the neck or a function of the neck's flexability in My.

(2) The LARD lumbar response during the –Gx testing indicated a tendency to have the Lumbar My peak flexion occur before the extension, but the extension value was always significantly larger (3X to more than 5X greater) than the flexion value. This was the case for the upright seat configuration, but when the seat was tilted or reclined backward, the LARD lumbar My was

primarily extension with little to no flexion recorded. This was in contrast to the LOIS which always had lumbar flexion be the dominant response over the extension. It is not clear at this point whether this was due to the forward translation of the torso causing the pelvis to roll or tip forward, or if the pelvis itself was rolling forward during the impact. Previous test data from similar –Gx test programs should be evaluted, or additional research into these tendencies may need to be conducted to clarify these responses.

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## LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| $711^{th}$ HPW | $711^{th}$ Human Performance Wing |
| ABP | Aircrew Biodynamics and Protection |
| ABW | Air Base Wing |
| ACES | Advanced Concept Ejection Seat |
| AFRL | Air Force Research Laboratory |
| AIS | Abbreviated Injury Scale |
| CG | Center of Gravity |
| DAS | Data Acquisition System |
| DTS | Diversified Technical Systems |
| DRI | Dynamic Response Index |
| fps | frames-per-second |
| HGU | Head Gear Unit |
| HIA | Horizontal Impulse Accelerator |
| HYGE | Hydraulically Controlled, Gas Energized |
| Hz | symbol for Hertz: unit of frequency in the International System of Units (SI) |
| in-lb | symbol for inch-pounds: unit of torque |
| JSF | Joint Strike Fighter |
| LARD | Large Anthropomorphic Research Device |
| LOIS | Lightest Occupant In Service |
| lb | symbol for pound; unit of weight |
| MANIC | Multi-Axial Neck Injury Criteria |
| MBU | Mask Breathing Unit |
| Mk | nomenclature for Martin Baker ejection seat |
| My | Moment about Y-Axis |
| NHTSA | National Highway Traffic and Safety Administration |
| NPD | Neck Protection Device |
| PC | Personnel Computer |
| PCU | Protective Combat Uniform |
| QRB | Quick Release Box |
| RAF | Royal Air Force |
| RH | Airman Systems Directorate under HPW |
| Ry | Rotational Acceleration about Y-Axis |
| SAE | Society of Automotive Engineers |
| SCH | Simplified Combined Harness |
| TDAS | Test Data Analysis System |
| USAF | United States Air Force |
| VDT | Vertical Decleration Tower |

# APPENDIX A.  ELECTRONIC DATA CHANNEL DESCRIPTIONS

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|---|---|
| PROGRAM: Comparative Assessment of Torso and Seat Mounted Restraint Systems using Vertical and Horizontal Impact Tests with Instrumented Manikins | TEST DATES: 29 May 2014 - 10 JUNE 2014; 14 Aug 2014 - 26 AUG 2014 |
| STUDY NUMBER: 201404 | TEST NUMBERS: 8780 - 8841; 8842 - 8908 |
| FACILITY: HORIZONTAL IMPACT ACCELERATOR | SAMPLE RATE: 1K |
| DATA COLLECTION SYSTEM: TDAS PRO | FILTER FREQUENCY: 120Hz |
| | TRANSDUCER RANGE (VOLTS): +/- 5 V |

| DATA CHANNEL | DATA POINT | TRANSDUCER MFG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | % Δ | DAS SENSITIVITY | BRIDGE | FULL SCALE | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DATE | SENS | DATE | SENS | | | | | |
| 1 | SLED X ACCEL (G) | ENDEVCO 7264-200 | CC99H | 14-Nov-13 | 3.0231 mv/g at 10V exc | 15-Aug-14 | 3.0189 mv/g at 10V exc | -0.4 | .30231 mv/v/g | FULL | 50 G | |
| 1 | SLED X ACCEL (G) | ENDEVCO 2262A-200 | MH82 | 25-Nov-13 | 2.0650 mv/g at 10V exc | 26-Sep-14 | 2.8421 mv/g at 10V exc | 1.0 | .20650 mv/v/g | FULL | 50 G | Used on tests |
| 2 | SLED Y ACCEL (G) | ENTRAN EGE-72-200 | 93C93 C19-R07 | 25-Nov-13 | 2.4095 mv/g at 10V exc | 15-Aug-14 | 2.4485 mv/g at 10V exc | 1.6 | .24095 mv/v/g | FULL | 50 G | |
| 2 | SLED Y ACCEL (G) | ENDEVC0 7264-200 | CC86H | 14-Nov-13 | 3.0231 mv/g at 10V exc | 26-Sep-14 | 2.0842 mv/g at 10V exc | 0.9 | .30231 mv/v/g | FULL | 50 G | Used on tests |
| 3 | SLED Z ACCEL (G) | ENTRAN EGE-72-200 | 93C93 C19-R02 | 25-Nov-13 | 2.2333 mv/v/g at 10V exc | 26-Sep-14 | 2.2992 mv/g at 10V exc | 2.9 | .22333 mv/v/g | FULL | 50 G | Used on all tests. |
| 4 | SLED VELOCITY (FT/SEC) | GLOBE IND 22A672-2 | 5 | 26-Nov-13 | 24.54 mv/ft/sec | 30-Sep-14 | 24.50 mv/ft/sec | -0.2 | 24.54 mv/ft/sec | FULL | 100 Ft/SEC | Used on all tests. |
| 5 | SEAT PAN X ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT06 (Z) | 13-Sep-13 | .8597 mv/g at 10V exc | 26-Sep-14 | .8645 mv/g at 10V exc | 0.6 | .08597 mv/v/g | FULL | 100 G | Used on all tests. |
| 6 | SEAT PAN Y ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT06 (Y) | 13-Sep-13 | .9052 mv/g at 10V exc | 26-Sep-14 | .9160 mv/g at 10V exc | 1.2 | .09052 mv/v/g | FULL | 100 G | Used on all tests. |
| 7 | SEAT PAN Z ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT06 (X) | 13-Sep-13 | .9016 mv/g at 10V exc | 26-Sep-14 | .9081 mv/g at 10V exc | 0.7 | .09016 mv/v/g | FULL | 100 G | Used on all tests. |
| 8 | LEFT LAP X FORCE (LB) | MICH SCI 3000 | 112 (Y) | 13-Feb-14 | 13.00 uv/lb at 10V exc | 5-Nov-14 | 12.71 uv/lb at 10V exc | -2.2 | .001300 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 9 | LEFT LAP Y FORCE (LB) | MICH SCI 3000 | 112 (X) | 13-Feb-14 | 12.99 uv/lb at 10V exc | 5-Nov-14 | 13.26 uv/lb at 10V exc | 2.1 | .001299 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 10 | LEFT LAP Z FORCE (LB) | MICH SCI 3000 | 112 (Z) | 13-Feb-14 | 11.50 uv/lb at 10V exc | 5-Nov-14 | 11.25 uv/lb at 10V exc | -2.2 | .001150 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 11 | RIGHT LAP X FORCE (LB) | MICH SCI 3000 | 111 (X) | 13-Feb-14 | 13.20 uv/lb at 10V exc | 5-Nov-14 | 12.96 uv/lb at 10V exc | -1.8 | .001320 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 12 | RIGHT LAP Y FORCE (LB) | MICH SCI 3000 | 111 (Y) | 13-Feb-14 | 12.96 uv/lb at 10V exc | 5-Nov-14 | 13.30 uv/lb at 10V exc | 2.6 | .001296 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 13 | RIGHT LAP Z FORCE (LB) | MICH SCI 3000 | 111 (Z) | 13-Feb-14 | 10.83 uv/lb at 10V exc | 5-Nov-14 | 11.06 uv/lb at 10V exc | 2.1 | .001083 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 14 | LEFT SHOULDER X FORCE (LB) | MICH SCI 4000 | 369 (Z) | 13-Feb-14 | 10.89 uv/lb at 10V exc | 5-Nov-14 | 10.58 uv/lb at 10V exc | -2.8 | .001089 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 15 | LEFT SHOULDER Y FORCE (LB) | MICH SCI 4000 | 369 (Y) | 13-Feb-14 | 12.75 uv/lb at 10V exc | 5-Nov-14 | 13.06 uv/lb at 10V exc | 2.4 | .001275 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 16 | LEFT SHOULDER Z FORCE (LB) | MICH SCI 4000 | 369 (X) | 13-Feb-14 | 12.71 uv/lb at 10V exc | 5-Nov-14 | 12.38 uv/lb at 10V exc | -2.6 | .001271 mv/v/lb | FULL | 1500 LB | Used on all tests. |

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| 17 | RIGHT SHOULDER X FORCE (LB) | MICH SCI 3000 | 110 (Z) | 13-Feb-14 | 11.05 uv/lb at 10V exc | 5-Nov-14 | 10.86 uv/lb at 10V exc | -1.7 | .001105 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 18 | RIGHT SHOULDER Y FORCE (LB) | MICH SCI 3000 | 110 (Y) | 13-Feb-14 | 13.19 uv/lb at 10V exc | 5-Nov-14 | 12.89 uv/lb at 10V exc | -2.3 | .001319 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 19 | RIGHT SHOULDER Z FORCE (LB) | MICH SCI 3000 | 110 (X) | 13-Feb-14 | 13.00 uv/lb at 10V exc | 5-Nov-14 | 13.25 uv/lb at 10V exc | 1.9 | .001300 mv/v/lb | FULL | 1500 LB | Used on all tests. |
| 20 | INT HEAD X ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT01 (X) | 25-Nov-13 | .8447 mv/g at 10V exc | 8-Oct-14 | .8371 mv/g at 10V exc | -0.9 | .08447 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 20 | INT HEAD X ACCEL (G) | ENTRAN EGV3-F-250 | Y117Q (X) | 16-Sep-13 | .8142 mv/g at 10V exc | 8-Oct-14 | .8142 mv/g at 10V exc | 0.0 | .08142 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 21 | INT HEAD Y ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT01 (Y) | 25-Nov-13 | .8614 mv/g at 10V exc | 8-Oct-14 | .8628 mv/g at 10V exc | 0.2 | .08614 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 21 | INT HEAD Y ACCEL (G) | ENTRAN EGV3-F-250 | Y117Q (Y) | 16-Sep-13 | .7969 mv/g at 10V exc | 8-Oct-14 | .7944 mv/g at 10V exc | -0.3 | .07969 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 22 | INT HEAD Z ACCEL (G) | ENTRAN EGV3-F-250 | 95F95F30 PT01 (Z) | 25-Nov-13 | .8795 mv/g at 10V exc | 8-Oct-14 | .8843 mv/g at 10V exc | 0.5 | .08795 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 22 | INT HEAD Z ACCEL (G) | ENTRAN EGV3-F-250 | Y117Q (Z) | 16-Sep-13 | .8218 mv/g at 10V exc | 8-Oct-14 | .8218 mv/g at 10V exc | 9.0 | .08218 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 23 | INT HEAD ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10178 | 19-Nov-13 | 3.44 uv/rad/sec2 at 10V exc | 25-Oct-14 | 3.50 uv/rad/sec2 at 10V exc | 1.7 | .000344 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 23 | INT HEAD ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10173 | 10-Jan-14 | 3.21 uv/rad/sec2 at 10V exc | 25-Oct-14 | 3.50 uv/rad/sec2 at 10V exc | 1.7 | .000321 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on LOIS tests 8816-8841; 8861-8892 |
| 24 | INT NECK X FORCE (LB) | DENTON 1716A | 473 | 27-Nov-13 | 8.24 uv/lb at 10V exc | 10-Oct-14 | 8.28 uv/lb at 10V exc | 0.5 | .000824 mv/v/lb | FULL | 2000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 24 | INT NECK X FORCE (LB) | DENTON 1716A | 121 | 15-Mar-13 | 8.21 uv/lb at 10V excd | 10-Oct-14 | 8.35 uv/lb at 10V exc | 0.2 | .000821 mv/v/lb | FULL | 2000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 25 | INT NECK Y FORCE (LB) | DENTON 1716A | 473 | 27-Nov-13 | 8.33 uv/lb at 10V exc | 10-Oct-14 | 8.42 uv/lb at 10V exc | 1.1 | .000833 mv/v/lb | FULL | 2000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 25 | INT NECK Y FORCE (LB) | DENTON 1716A | 121 | 15-Mar-13 | 8.35 uv/lb at 10V exc | 10-Oct-14 | 8.47 uv/lb at 10V exc | 0.5 | .000835 mv/v/lb | FULL | 2000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 26 | INT NECK Z FORCE (LB) | DENTON 1716A | 473 | 27-Nov-13 | 4.41 uv/lb at 10V exc | 10-Oct-14 | 4.43 uv/lb at 10V exc | 0.5 | .000441 mv/v/lb | FULL | 3000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 26 | INT NECK Z FORCE (LB) | DENTON 1716A | 121 | 15-Mar-13 | 4.57 uv/lb at 10V exc | 10-Oct-14 | 4.63 uv/lb at 10V exc | 0.2 | .000457 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 27 | INT NECK Mx TORQUE (IN-LB) | DENTON 1716A | 473 | 27-Nov-13 | 6.67 uv/in-lb at 10V exc | 10-Oct-14 | 6.68 uv/in-lb at 10V exc | 0.1 | .000667 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 27 | INT NECK Mx TORQUE (IN-LB) | DENTON 1716A | 121 | 15-Mar-13 | 6.71 uv/in-lb at 10V exc | 10-Oct-14 | 6.78 uv/in-lb at 10V exc | 0.0 | .000671 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 28 | INT NECK My TORQUE (IN-LB) | DENTON 1716A | 473 | 27-Nov-13 | 6.69 uv/in-lb at 10V exc | 10-Oct-14 | 6.72 uv/in-lb at 10V exc | 0.4 | .000669 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | INT NECK My TORQUE (IN-LB) | DENTON 1716A | 121 | 15-Mar-13 | 6.74 uv/in-lb at 10V exc | 10-Oct-14 | 6.87 uv/in-lb at 10V exc | 1.0 | .000674 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 29 | INT NECK Mz TORQUE (IN-LB) | DENTON 1716A | 473 | 27-Nov-13 | 9.05 uv/in-lb at 10V exc | 10-Oct-14 | 9.07 uv/in-lb at 10V exc | 0.2 | .000905 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 29 | INT NECK Mz TORQUE (IN-LB) | DENTON 1716A | 121 | 15-Mar-13 | 9.09 uv/in-lb at 10V exc | 10-Oct-14 | 9.22 uv/in-lb at 10V exc | 1.1 | .000909 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 30 | INT CHEST X ACCEL (G) | ENTRAN EGV3-F-250 | 98D98D25 TA03 (X) | 24-Jan-14 | .9341 mv/g at 10V exc | 8-Oct-14 | .9067 mv/g at 10V exc | -2.9 | .09341 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 30 | INT CHEST X ACCEL (G) | ENTRAN EGV3-F-250 | 99J99J30 TE03 (X) | 10-Jan-14 | .8730 mv/g at 10V exc | 8-Oct-14 | .8473 mv/g at 10V exc | -2.9 | .08730 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 31 | INT CHEST Y ACCEL (G) | ENTRAN EGV3-F-250 | 98D98D25 TA03 (Y) | 24-Jan-14 | .9397 mv/g at 10V exc | 8-Oct-14 | .9149 mv/g at 10V exc | -2.6 | .09397 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 31 | INT CHEST Y ACCEL (G) | ENTRAN EGV3-F-250 | 99J99J30 TE03 (Y) | 10-Jan-14 | .9629 mv/g at 10V exc | 8-Oct-14 | .9349 mv/g at 10V exc | -2.9 | .09629 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 32 | INT CHEST Z ACCEL (G) | ENTRAN EGV3-F-250 | 98D98D25 TA03 (Z) | 24-Jan-14 | .9740 mv/g at 10V exc | 8-Oct-14 | 1.0025 mv/g at 10V exc | 2.9 | .09740 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 32 | INT CHEST Z ACCEL (G) | ENTRAN EGV3-F-250 | 99J99J30 TE03 (Z) | 10-Jan-14 | .9629 mv/g at 10V exc | 8-Oct-14 | .9352 mv/g at 10V exc | -2.9 | .09629 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 33 | INT LUMBAR X ACCEL (G) | ENTRAN EGV3-F-250 | S1103E (X) | 25-Nov-13 | .8258 mv/g at 10v exc | 9-Oct-14 | .8289 mv/g at 10V exc | 0.4 | .08258 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 33 | INT LUMBAR X ACCEL (G) | ENTRAN EGV3-F-250 | Y117L(X) | 25-Nov-13 | .5990 mv/g at 10V exc | 8-Oct-14 | .5973 mv/g at 10V exc | -0.3 | .05590 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 34 | INT LUMBAR Y ACCEL (G) | ENTRAN EGV3-F-250 | S1103E (Y) | 25-Nov-13 | .9412 mv/g at 10V exc | 9-Oct-14 | .9395 mv/g at 10V exc | -0.2 | .09412 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 34 | INT LUMBAR Y ACCEL (G) | ENTRAN EGV3-F-250 | Y117L(Y) | 25-Nov-13 | .6507 mv/g at 10V exc | 8-Oct-14 | .6499 mv/g at 10V exc | -0.1 | .06507 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 35 | INT LUMBAR Z ACCEL (G) | ENTRAN EGV3-F-250 | S1103E (Z) | 25-Nov-13 | .7624 mv/g at 10V exc | 9-Oct-14 | .7636 mv/g at 10V exc | 0.2 | .07624 mv/v/g | FULL | 100 G | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 35 | INT LUMBAR Z ACCEL (G) | ENTRAN EGV3-F-250 | Y117L(Z) | 25-Nov-13 | .8289 mv/g at 10V exc | 8-Oct-14 | .8252 mv/g at 10V exc | -0.4 | .08289 mv/v/g | FULL | 100 G | Used on LOIS tests 8816-8841; 8861-8892 |
| 36 | INT LUMBAR X FORCE (LB) | DENTON 1914A | 310 | 28-Jan-14 | 6.71 uv/lb at 10V exc | 14-Oct-14 | 6.71 uv/lb at 10V exc | 0.0 | .000671 mv/v/lb | FULL | 3000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 36 | INT LUMBAR X FORCE (LB) | DENTON 1914A | 503 | 19-Mar-13 | 6.54 mv/lb atr 10V exc | 14-Oct-14 | 6.58 uv/lb at 10V exc | 0.6 | .000654 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 37 | INT LUMBAR Y FORCE (LB) | DENTON 1914A | 310 | 28-Jan-14 | 6.71 uv/lb at 10V exc | 14-Oct-14 | 6.72 uv/lb at 10V exc | 0.1 | .000671 mv/v/lb | FULL | 3000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 37 | INT LUMBAR Y FORCE (LB) | DENTON 1914A | 503 | 19-Mar-13 | 6.55 uv/lb at 10V exc | 14-Oct-14 | 6.59 uv/lb at 10V exc | 0.6 | .000655 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 38 | INT LUMBAR Z FORCE (LB) | DENTON 1914A | 310 | 28-Jan-14 | 2.80 uv/lb at 10V exc | 14-Oct-14 | 2.81 uv/lb at 10V exc | 0.4 | .000280 mv/v/lb | FULL | 5000 LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 38 | INT LUMBAR Z FORCE (LB) | DENTON 1914A | 503 | 19-Mar-13 | 2.69 uv/lb at 10V exc | 14-Oct-14 | 2.71 uv/lb at 10V exc | 0.7 | .000269 mv/v/lb | FULL | 5000 LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 39 | INT LUMBAR Mx TORQUE (IN-LB) | DENTON 1914A | 310 | 28-Jan-14 | 5.20 uv/in-lb at 10V exc | 14-Oct-14 | 5.23 uv/in-lb at 10V exc | 0.6 | .000520 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 39 | INT LUMBAR Mx TORQUE (IN-LB) | DENTON 1914A | 503 | 19-Mar-13 | 5.09 uv/in-lb at 10V exc | 14-Oct-14 | 5.16 uv/in-lb at 10V exc | 1.4 | .000509 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1914A | 310 | 28-Jan-14 | 5.18 uv/in-lb at 10V exc | 14-Oct-14 | 5.20 uv/in-lb at 10V exc | 0.4 | .000518 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1914A | 503 | 19-Mar-13 | 5.09 uv/in-lb at 10V exc | 14-Oct-14 | 5.14 uv/in-lb at 10V exc | 1.0 | .000509 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |
| 41 | INT LUMBAR Mz TORQUE (IN-LB) | DENTON 1914A | 310 | 28-Jan-14 | 8.73 uv/in-lb at 10V exc | 14-Oct-14 | 8.70 uv/in-lb at 10V exc | -0.3 | .000873 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 8780-8815;8842-8860;8893-8908 |
| 41 | INT LUMBAR Mz TORQUE (IN-LB) | DENTON 1914A | 503 | 19-Mar-13 | 8.38 uv/in-lb at 10V exc | 14-Oct-14 | 8.51 uv/in-lb at 10V exc | 1.6 | .000838 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 8816-8841; 8861-8892 |

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| PROGRAM: Comparative Assessment of Torso and Seat Mounted Restraint Systems using Vertical and Horizontal Impact Tests with Instrumented Manikins (Part III) | TEST DATES; |
|---|---|
| STUDY NUMBER: 201502 | TEST NUMBERS: |
| FACILITY: HORIZONTAL IMPACT ACCELERATOR | SAMPLE RATE: 1K |
| DATA COLLECTION SYSTEM: TDAS PRO | FILTER FREQUENCY: 120Hz |
| | TRANSDUCER RANGE (VOLTS): +/- 5 V |

| DATA CHANNEL | DATA POINT | TRANSDUCER MFG. & MODEL | SERIAL NUMBER | PRE-CAL | | POST-CAL | | % Δ | DAS SENSITIVITY | BRIDGE | FULL SCALE | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DATE | SENS | DATE | SENS | | | | | |
| 1 | SLED X ACCEL (G) | ENDEVCO 2262A-200 | HM75 | 26-Mar-15 | 4.3913 mv/g at 10V exc | 17-Jun-15 | 4.4032 mv/g at 10V exc | 0.3 | .43913 mv/v/g | FULL | 50 G | Used on alll tests |
| 2 | SLED Y ACCEL (G) | ENTRAN EGE-72-200 | 93C93 C19-R07 | 26-Mar-15 | 2.4066 mv/g at 10V exc | 17-Jun-15 | 2.3984 mv/g at 10V exc | -0.3 | .24066 mv/v/g | FULL | 50 G | Used on alll tests |
| 3 | SLED Z ACCEL (G) | ENTRAN EGE-72-200 | 93C93 C19-R02 | 26-Mar-15 | 2.2316 mv/g at 10V exc | 17-Jun-15 | 2.2191 mv/g at 10V exc | -0.6 | .22316 mv/v/g | FULL | 50 G | Used on alll tests |
| 4 | SEAT PAN X ACCEL (G) | ENTRAN EGV3-F-250 | M090CH (X) | 15-Feb-15 | .7785 mv/g at 10V exc | 18-Jun-15 | .7814 mv/g at 10V exc | 0.4 | .09064 mv/v/g | FULL | 100 G | Used on alll tests |
| 5 | SEAT PAN Y ACCEL (G) | ENTRAN EGV3-F-250 | M090CH (Y) | 15-Feb-15 | .8020 mv/g at 10V exc | 18-Jun-15 | .8037 mv/g at 10V exc | 0.2 | .08804 mv/v/g | FULL | 100 G | Used on alll tests |
| 6 | SEAT PAN Z ACCEL (G) | ENTRAN EGV3-F-250 | M090CH (Z) | 15-Feb-15 | .6804 mv/g at 10V exc | 18-Jun-15 | .6801 mv/g at 10V exc | -0.1 | .08863 mv/v/g | FULL | 100 G | Used on alll tests |
| 7 | LEFT LAP X FORCE (LB) | MICH SCI 3000 | 3 (Z) | 27-Apr-15 | 10.65 uv/lb at 10V exc | 14-Nov-15 | 10.96 uv/lb at 10V exc | 2.9 | .001065 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 8 | LEFT LAP Y FORCE (LB) | MICH SCI 3000 | 3 (Y) | 27-Apr-15 | 13.24 uv/lb at 10V exc | 14-Nov-15 | 13.47 uv/lb at 10V exc | 1.7 | .001324 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 9 | LEFT LAP Z FORCE (LB) | MICH SCI 3000 | 3 (X) | 27-Apr-15 | 13.37 uv/lb at 10V exc | 14-Nov-15 | 13.77 uv/lb at 10V exc | 3.0 | .001337 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 10 | RIGHT LAP X FORCE (LB) | MICH SCI 4000 | 110 (Z) | 27-Apr-15 | 9.94 uv/lb at 10V exc | 14-Nov-15 | 10.12 uv/lb at 10V exc | 1.8 | .000994 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 11 | RIGHT LAP Y FORCE (LB) | MICH SCI 4000 | 110 (Y) | 27-Apr-15 | 12.38 uv/lb at 10V exc | 14-Nov-15 | 12.69 uv/lb at 10V exc | 2.5 | .001238 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 12 | RIGHT LAP Z FORCE (LB) | MICH SCI 4000 | 110 (X) | 27-Apr-15 | 12.58 uv/lb at 10V exc | 14-Nov-15 | 12.88 uv/lb at 10V exc | 2.4 | .001258 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 13 | LEFT SHOULDER X FORCE (LB) | MICH SCI 3000 | 369 (Z) | 27-Apr-15 | 10.05 uv/lb at 10V exc | 14-Nov-15 | 10.29 uv/lb at 10V exc | 2.4 | .00105 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 14 | LEFT SHOULDER Y FORCE (LB) | MICH SCI 3000 | 369 (Y) | 27-Apr-15 | 13.12 uv/lb at 10V exc | 14-Nov-15 | 13.45 uv/lb at 10V exc | 2.5 | .001312 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 15 | LEFT SHOULDER Z FORCE (LB) | MICH SCI 3000 | 369 (X) | 27-Apr-15 | 12.18 uv/lb at 10V exc | 14-Nov-15 | 12.46 uv/lb at 10V exc | 2.3 | .001218 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 16 | RIGHT SHOILDER X FORCE (LB) | MICH SCI 3000 | 111 (Z) | 27-Apr-15 | 9.78 uv/lb at 10V exc | 14-Nov-15 | 10.02 uv/lb at 10V exc | 2.5 | .000978 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 17 | RIGHT SHOULDER Y FORCE (LB) | MICH SCI 3000 | 111 (Y) | 27-Apr-15 | 12.05 uv/lb at 10V exc | 14-Nov-15 | 12.33 uv/lb at 10V exc | 2.3 | .001205 mv/v/lb | FULL | 1500 LB | Used on alll tests |

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| 18 | RIGHT SHOULDER Z FORCE (LB) | MICH SCI 3000 | 111 (X) | 27-Apr-15 | 12.13 uv/lb at 10V exc | 14-Nov-15 | 12.41 uv/lb at 10V exc | 2.3 | .001213 mv/v/lb | FULL | 1500 LB | Used on alll tests |
| 19 | INT HEAD X ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130NV | 26-Mar-15 | .6312 mv/g at 10V exc | 27-May-15 | .6304 mv/g at 10V exc | -0.1 | .06312 mv/v/g | FULL | 50 G | Used on AERO50 tests 6665-6699 |
| 19 | INT HEAD X ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080A8 | 4-May-15 | .5071 mv/g at 10V exc | 17-Jun-15 | .5068 mv/g at 10V exc | -0.1 | .05071 mv/v/g | FULL | 50 G | Used on AUTO50 tests 6700-6723 |
| 19 | INT HEAD X ACCEL (G) | MEAS SPEC EGCS-S425-250 | R13083 | 4-May-15 | .5868 mv/g at 10V exc | 1-Jun-15 | .5871 mv/g at 10V exc | 0.0 | .05868 mv/v/g | FULL | 50 G | Used on LARD tests 6724-6731 |
| 19 | INT HEAD X ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130NQ | 4-May-15 | .5738 mv/g at 10V exc | 2-Jun-15 | .5795 mv/g at 10V exc | 1.0 | .0005738 mv/v/g | FULL | 50 G | Used on LOIS tests 6732-6738 |
| 20 | INT HEAD Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130NT | 15-Aug-14 | .5930 mv/g at 10V exc | 27-May-15 | .5888 mv/g at 10V exc | -0.7 | .05930 mv/v/g | FULL | 50 G | Used on AERO50 tests 6665-6699 |
| 20 | INT HEAD Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080AG | 4-May-15 | .4355 mv/g at 10V exc | 18-Jun-15 | .4344 mv/g at 10V exc | -0.3 | .04355 mv/v/g | FULL | 50 G | Used on AUTO50 tests 6700-6723 |
| 20 | INT HEAD Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | R1307Y | 4-May-15 | .5520 mv/g at 10V exc | 1-Jun-15 | .5532 mv/g at 10V exc | 0.2 | .05520 mv/v/g | FULL | 50 G | Used on LARD tests 6724-6731 |
| 20 | INT HEAD Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130NU | 4-May-15 | .5670 mv/g at 10V exc | 2-Jun-15 | .5741 mv/g at 10V exc | 1.3 | .05670 mv/v/g | FULL | 50 G | Used on LOIS tests 6732-6738 |
| 21 | INT HEAD Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080AE | 4-May-15 | .4417 mv/g at 10V exc | 27-May-15 | .4415 mv/g at 10V exc | -0.1 | .04417 mv/v/g | FULL | 100 G | Used on AERO50 tests 6665-6699 |
| 21 | INT HEAD Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | M080XV | 05-Apr-15 | .5133 mv/g at 10V exc | 17-Jun-15 | .5127 mv/g at 10V exc | -0.1 | .05133 mv/v/g | FULL | 100 G | Used on AUTO50 tests 6700-6723 |
| 21 | INT HEAD Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080AF | 04-May-15 | .4536 mv/g at 10V exc | 1-Jun-15 | .4539 mv/g at 10V exc | 0.1 | .04536 mv/v/g | FULL | 100 G | Used on LARD tests 6724-6731 |
| 21 | INT HEAD Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | R1307X | 04-May-15 | .5758 mv/g at 10V exdc | 2-Jun-15 | .5783 mv/g at 10V exc | 0.4 | .05758 mv/v/g | FULL | 100 G | Used on LOIS tests 6732-6738 |
| 22 | INT HEAD RY ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10214 | 12-Feb-15 | 3.66 uv/rad/sec2 at 10V exc | 1-Jun-15 | 3.7 uv/rad/sec2 at 10V exc | 1.1 | .000366 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on AERO50 tests 6665-6699 |
| 22 | INT HEAD RY ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | A20Y | 27-Apr-15 | 3.38 uv/rad/sec2 at 10V exc | 18-Jun-15 | 3.35 uv/rad/sec2 at 10V exc | -0.9 | .000338 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on AUTO50 tests 6700-6723 |
| 22 | INT HEAD RY ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10229 | 5-May-15 | 3.62 mv/rad/sec2 | 1-Jun-15 | 3.54 uv/rad/sec2 at 10V exc | -2.2 | .000362 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on LARD tests 6724-6731 |
| 22 | INT HEAD RY ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10203 | 5-May-15 | 4.28 uv/rad/sec2 at 10V exc | 2-Jun-15 | 4.18 uv/rad/sec2 at 10V exc | -2.3 | .000428 mv/v/rad/sec | FULL | 5000 RAD?SEC2 | Used on LOIS tests 6732-6738 |
| 23 | INT NECK X FORCE (LB) | DENTON 1716A | 624 | 30-Apr-15 | 8.23 uv/lb at 10V exc | 3-Jun-15 | 8.20 uv/lb at 10V exc | -0.4 | .000823 mv/v/lb | FULL | 2000 LB | Used on AERO50 tests 6665-6699 |
| 23 | INT NECK X FORCE (LB) | DENTON 1716A | 553 | 30-Apr-15 | 8.17 uv/lb at 10V exc | 18-Jun-15 | 8.14 uv/lb at 10V exc | -0.4 | .000817 mv/v/lb | FULL | 2000 LB | Used on AUTO50 tests 6700-6723 |
| 23 | INT NECK X FORCE (LB) | DENTON 1716A | 127 | 1-May-15 | 8.24 uv/lb at 10v exc | 2-Jun-15 | 8.25 uv/lb at 10V exc | 0.1 | .000824 mv/v/lb | FULL | 2000 LB | Used on LARD tests 6724-6731 |
| 23 | INT NECK X FORCE (LB) | DENTON 1716A | 469 | 1-May-15 | 8.20 uv/lb at 10V exc | 3-Jun-15 | 8.20 uv/lb at 10V exc | 0.0 | .000820 mv/v/lb | FULL | 2000 LB | Used on LOIS tests 6732-6738 |
| 24 | INT NECK Y FORCE (LB) | DENTON 1716A | 624 | 30-Apr-15 | 8.41 uv/lb at 10V exc | 03-Jun-15 | 8.39 uv/lb at 10V exc | -0.4 | .000841 mv/v/lb | FULL | 2000 LB | Used on AERO50 tests 6665-6699 |
| 24 | INT NECK Y FORCE (LB) | DENTON 1716A | 553 | 30-Apr-15 | 8.65 uv/lb at 10V exc | 18-Jun-15 | 8.60 uv/lb at 10V exc | -0.6 | .000865 mv/v/lb | FULL | 2000 LB | Used on AUTO50 tests 6700-6723 |

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| 24 | INT NECK Y FORCE (LB) | DENTON 1716A | 127 | 1-May-15 | 8.27 uv/lb at 10V exc | 02-Jun-15 | 8.28 uv/lb at 10V exc | 0.1 | .000827 mv/v/lb | FULL | 2000 LB | Used on LARD tests 6724-6731 |
| 24 | INT NECK Y FORCE (LB) | DENTON 1716A | 469 | 1-May-15 | 8.27 uv/lb at 10V exc | 3-Jun-15 | 8.27 uv/lb at 10V exc | 0.0 | .000827 mv/v/lb | FULL | 2000 LB | Used on LOIS tests 6732-6738 |
| 25 | INT NECK Z FORCE (LB) | DENTON 1716A | 624 | 30-Apr-15 | 4.63 uv/lb at 10V exc | 03-Jun-15 | 4.67 uv/lb at 10V exc | 0.9 | .000463 mv/v//lb | FULL | 3000 LB | Used on AERO50 tests 6665-6699 |
| 25 | INT NECK Z FORCE (LB) | DENTON 1716A | 553 | 30-Apr-15 | 4.03 uv/lb at 10V exc | 18-Jun-15 | 4.04 uv/lb at 10V exc | 0.2 | .000403 mv/v/lb | FULL | 3000 LB | Used on AUTO50 tests 6700-6723 |
| 25 | INT NECK Z FORCE (LB) | DENTON 1716A | 127 | 1-May-15 | 4.70 uv/lb at 10V exc | 02-Jun-15 | 4.69 uv/lb at 10V exc | -0.2 | .000470 mv/v/lb | FULL | 3000 LB | Used on LARD tests 6724-6731 |
| 25 | INT NECK Z FORCE (LB) | DENTON 1716A | 469 | 1-May-15 | 4.03 uv/lb at 10V exc | 03-Jun-15 | 4.02 uv/lb at 10V exc | -0.2 | .000403 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 6732-6738 |
| 26 | INT Neck Mx TORQUE (IN-LB) | DENTON 1716A | 624 | 30-Apr-15 | 6.81 uv/in-lb at 10V exc | 03-Jun-15 | 6.81 uv/in-lb at 10V exc | 0.0 | .000681 mv/v/in-lb | FULL | 2500 IN-LB | Used on AERO50 tests 6665-6699 |
| 26 | INT Neck Mx TORQUE (IN-LB) | DENTON 1716A | 553 | 30-Apr-15 | 6.72 uv/in-lb at 10V exc | 18-Jun-15 | 6.68 uv/in-lb at 10V exc | -0.6 | .000672 mv/v/in-lb | FULL | 2500 IN-LB | Used on AUTO50 tests 6700-6723 |
| 26 | INT Neck Mx TORQUE (IN-LB) | DENTON 1716A | 127 | 1-May-15 | 6.72 uv/in-lb at 10V exc | 02-Jun-15 | 6.62 uv/in-lb at 10V exc | -1.5 | .000672 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 6724-6731 |
| 26 | INT Neck Mx TORQUE (IN-LB) | DENTON 1716A | 469 | 1-May-15 | 6.57 uv-in-lb at 10V exc | 03-Jun-15 | 6.57 uv/in-lb at 10V exc | 0.0 | .000657 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 6732-6738 |
| 27 | INT Neck My TORQUE (IN-LB) | DENTON 1716A | 624 | 30-Apr-15 | 6.90 uv/in-lb at 10V exc | 03-Jun-15 | 6.83 uv/in-lb at 10V exc | -1.0 | .000690 mv/v/in-lb | FULL | 2500 IN-LB | Used on AERO50 tests 6665-6699 |
| 27 | INT Neck My TORQUE (IN-LB) | DENTON 1716A | 553 | 30-Apr-15 | 6.81 uv/in-lb at 10V exc | 18-Jun-15 | 6.73 uv/in-lb at 10V exc | -1.1 | .000681 mv/v/in-lb | FULL | 2500 IN-LB | Used on AUTO50 tests 6700-6723 |
| 27 | INT Neck My TORQUE (IN-LB) | DENTON 1716A | 127 | 1-May-15 | 6.65 uv/in-lb at 10V exc | 02-Jun-15 | 6.71 uv/in-lb at 10V exc | 0.9 | .000665 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 6724-6731 |
| 27 | INT Neck My TORQUE (IN-LB) | DENTON 1716A | 469 | 1-May-15 | 6.62 uv/in-lb at 10V exc | 03-Jun-15 | 6.63 uv/in-lb at 10V exc | 0.2 | .000662 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 6732-6738 |
| 28 | INT Neck Mz TORQUE (IN-LB) | DENTON 1716A | 624 | 30-Apr-15 | 9.21 uv/in-lb at 10V exc | 03-Jun-15 | 9.19 uv/in-lb at 10V exc | -0.2 | .000921 mv/v/in-lb | FULL | 2500 IN-LB | Used on AERO50 tests 6665-6699 |
| 28 | INT Neck Mz TORQUE (IN-LB) | DENTON 1716A | 553 | 30-Apr-15 | 9.16 uv/in-lb at 10V exc | 18-Jun-15 | 9.05 uv/in-lb at 10V exc | -1.2 | .000916 mv/v/in-lb | FULL | 2500 IN-LB | Used on AUTO50 tests 6700-6723 |
| 28 | INT Neck Mz TORQUE (IN-LB) | DENTON 1716A | 127 | 1-May-15 | 8.88 uv/in-lb at 10V exc | 2-Jun-15 | 8.86 uv/in-lb at 10V exc | -0.2 | .000888 mv/v/in-lb | FULL | 2500 IN-LB | Used on LARD tests 6724-6731 |
| 28 | INT Neck Mz TORQUE (IN-LB) | DENTON 1716A | 469 | 1-May-15 | 8.83 uv/in-lb at 10V exc | 3-Jun-15 | 8.82 uv/in-lb at 10V exc | -0.1 | .000883 mv/v/in-lb | FULL | 2500 IN-LB | Used on LOIS tests 6732-6738 |
| 29 | INT CHEST X ACCEL (G) | MEAS SPEC EGCS-S425-250 | M080XT | 4-May-15 | .4989 mv/g at 10V exc | 27-May-15 | .4991 mv/g at 10V exc | 0.1 | .04989 mv/v/g | FULL | 50 G | Used on AERO50 tests 6665-6699 |
| 29 | INT CHEST X ACCEL (G) | MEAS SPEC EGCS-S425-250 | T13132 | 6-Apr-15 | .5713 mv/g at 10V exc | 17-Jun-15 | .5775 mv/g at 10V exc | 1.1 | .05713 mv/v/g | FULL | 50 G | Used on AUTO50 tests 6700-6723 |

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| 29 | INT CHEST X ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080A7 | 4-May-15 | .4386 mv/g at 10V exc | 1-Jun-15 | .4386 mv/g at 10V exc | 0.0 | .04386 mv/v/g | FULL | 50 G | Used on LARD tests 6724-6731 |
| 29 | INT CHEST X ACCEL (G) | MEAS SPEC EGCS-S425-250 | 96j996j 15tb04 (X) | 18-Feb-15 | .7817 mv/g at 10V exc | 2-Jun-15 | .7834 mv/g at 10V exc | 0.2 | .07817 mv/v/g | FULL | 50 G | Used on LOIS tests 6732-6738 |
| 30 | INT CHEST Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080A9 | 4-May-15 | .5526 mv/g at 10V exc | 27-May-15 | .5526 mv/g at 10V exc | 0.0 | .05526 mv/v/g | FULL | 50 G | Used on AERO50 tests 6665-6699 |
| 30 | INT CHEST Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130NP | 12-Feb-15 | .6100 mv/g at 10V exc | 18-Jun-15 | .6103 mv/g at 10V exc | 0.1 | .06100 mv/v/g | FULL | 50 G | Used on AUTO50 tests 6700-6723 |
| 30 | INT CHEST Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | S080AC | 4-May-15 | .5399 mv/g at 10V exc | 1-Jun-15 | .5407 mv/g at 10V exc | 0.2 | .05399 mv/v/g | FULL | 50 G | Used on LARD tests 6724-6731 |
| 30 | INT CHEST Y ACCEL (G) | MEAS SPEC EGCS-S425-250 | 96j996j 15tb04 (Y) | 18-Feb-15 | .7797 mv/g at 10V exc | 2-Jun-15 | .7780 mv/g at 10V exc | -0.2 | .07797 mv/v/g | FULL | 50 G | Used on LOIS tests 6732-6738 |
| 31 | INT CHEST Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | M080XU | 4-May-15 | .4460 mv/g at 10V exc | 27-May-15 | .4465 mv/g at 10V exc | 0.1 | .04460 mv/v/g | FULL | 100 G | Used on AERO50 tests 6665-6699 |
| 31 | INT CHEST Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | R13086 | 4-May-15 | .5877 mv/g at 10V exc | 18-Jun-15 | .5874 mv/g at 10V exc | -0.1 | .05877 mv/v/g | FULL | 100 G | Used on AUTO50 tests 6700-6723 |
| 31 | INT CHEST Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | R130P1 | 4-May-15 | .6360 mv/g at 10V exc | 1-Jun-15 | .6388 mv/g at 10V exc | 0.4 | .06360 mv/v/g | FULL | 100 G | Used on LARD tests 6724-6731 |
| 31 | INT CHEST Z ACCEL (G) | MEAS SPEC EGCS-S425-250 | 96j996j 15tb04 (Z) | 18-Feb-15 | .8164 mv/g at 10V exc | 2-Jun-15 | .8156 mv/g at 10V exc | -0.1 | .08164 mv/v/g | FULL | 100 G | Used on LOIS tests 6732-6738 |
| 32 | INT CHEST Ry ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10178 | 26-Feb-15 | 3.58 uv/rad/sec2 at 10V exc | 01-Jun-15 | 3.57 uv/rad/sec2 at 10V exc | -0.3 | .000358 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on AERO50 tests 6665-6699 |
| 32 | INT CHEST Ry ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10175 | 27-Apr-15 | 3.49 uv/rad/sec2 at 10V exc | 18-Jun-15 | 3.38 uv/rad/sec2 at 10V exc | -3.0 | .000349 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on AUTO50 tests 6700-6723 |
| 32 | INT CHEST Ry ANG ACCEL (RAD/SEC2) | ENDEVCO 7302BM4 | 10213 | 13-May-15 | 6.11 uv/rad/sec2 at 10V exc | 1-Jun-15 | 4.95 uv/rad/sec2 at 10V exc | -2.6 | .000611 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on LARD tests 6724-6731 |
| 32 | INT CHEST Ry ANG ACCEL (RAD/SEC2) | ENDEVCO 7302B | 10020 | 12-Feb-15 | 4.77 uv/rad/sec2 at 10V exc | 2-Jun-15 | 4.80 uv/rad/sec2 at 10V exc | 0.6 | .000477 mv/v/rad/sec2 | FULL | 5000 RAD/SEC2 | Used on LOIS tests 6732-6738 |
| 33 | INT LUMBAR X ACCEL (LB) | ENTRAN EGV3-F-250 | Y1117L (X) | 12-Feb-15 | .5976 mv/g at 10V exc | 27-May-15 | .5998 mv/g at 10V exc | 0.4 | .05976 mv/v/g | FULL | 100 G | Used on AERO50 tests 6665-6699 |
| 33 | INT LUMBAR X ACCEL (LB) | MEAS SPEC EGCS-S425-250 | R1307Z | 4-May-15 | .6179 mv/g at 10V exc | 18-Jun-15 | .6176 mv/g at 10V exc | -0.1 | .06179 mv/v/g | FULL | 100 G | Used on AUTO50 tests 6700-6723 |
| 33 | INT LUMBAR X ACCEL (LB) | ENTRAN EGV3-F-250 | M110KX (X) | 15-Feb-15 | .7440 mv/g at 10V exc | 01-Jun-15 | .7449 mv/g at 10V exc | 0.1 | .07440 mv/v/g | FULL | 100 G | Used on LARD tests 6724-6731 |
| 33 | INT LUMBAR X ACCEL (LB) | ENTRAN EGV3-F-250 | Y117Q (X) | 18-Feb-15 | .8015 mv/g at 10V exc | 02-Jun-15 | .8133 mv/g at 10V exc | 1.5 | .08015 mv/v/g | FULL | 100 G | Used on LOIS tests 6732-6738 |
| 34 | INT LUMBAR Y ACCEL (LB) | ENTRAN EGV3-F-250 | Y1117L (Y) | 12-Feb-15 | .6499 mv/g at 10V exc | 27-May-15 | .6519 mv/g at 10V exc | 0.3 | .06499 mv/v/g | FULL | 100 G | Used on AERO50 tests 6665-6699 |
| 34 | INT LUMBAR Y ACCEL (LB) | MEAS SPEC EGCS-S425-250 | R130P2 | 4-May-15 | .5896 mv/g at 10V exc | 18-Jun-15 | .5894 mv/g at 10V exc | -0.1 | .05896 mv/v/g | FULL | 100 G | Used on AUTO50 tests 6700-6723 |
| 34 | INT LUMBAR Y ACCEL (LB) | ENTRAN EGV3-F-250 | M110KX (Y) | 15-Feb-15 | .7203 mv/g at 10V exc | 01-Jun-15 | .7121 mv/g at 10V exc | -1.1 | .07203 mv/v/g | FULL | 100 G | Used on LARD tests 6724-6731 |
| 34 | INT LUMBAR Y ACCEL (LB) | ENTRAN EGV3-F-250 | Y117Q (Y) | 18-Feb-15 | .7924 mv/g at 10V ex | 02-Jun-15 | .7941 mv/g at 10V exc | 0.2 | .07924 mv/v/g | FULL | 100 G | Used on LOIS tests 6732-6738 |
| 35 | INT LUMBAR Z ACCEL (LB) | ENTRAN EGV3-F-250 | Y1117L (Z) | 12-Feb-15 | .8278 mv/g at 10V exc | 27-May-15 | .8295 mv/g at 10V exc | 0.2 | .08278 mv/v/g | FULL | 100 G | Used on AERO50 tests 6665-6699 |
| 35 | INT LUMBAR Z ACCEL (LB) | MEAS SPEC EGCS-S425-250 | R13087 | 4-May-15 | .5755 mv/g at 10V exc | 17-Jun-15 | .5707 mv/g at 10V exc | -0.8 | .05755 mv/v/g | FULL | 100 G | Used on AUTO50 tests 6700-6723 |

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| 35 | INT LUMBAR Z ACCEL (LB) | ENTRAN EGV3-F-250 | M110KX (Z) | 15-Feb-15 | .6892 mv/g at 10V exc | 01-Jun-15 | .6895 mv/g at 10V exc | 0.0 | .06892 mv/v/g | FULL | 100 G | Used on LARD tests 6724-6731 |
| 35 | INT LUMBAR Z ACCEL (LB) | ENTRAN EGV3-F-250 | Y117Q (Z) | 18-Feb-15 | .8238 mv/g at 10V exc | 02-Jun-15 | .8235 mv/g at 10V exc | 0.0 | .08238 mv/v/g | FULL | 100 G | Used on LOIS tests 6732-6738 |
| 36 | INT LUMBAR X FORCE LB) | DENTON 1914A | 154 | 1-May-15 | 6.64 uv/lb at 10V exc | 05-Jun-15 | 6.61 uv/lb at 10V exc | -0.5 | .000664 mv/v/lb | FULL | 3000 LB | Used on AERO50 tests 6665-6699 |
| 36 | INT LUMBAR X FORCE LB) | DENTON 1842 | DP1102 | 3-Dec-13 | 3.25 uv/lb at 10V exc | 21-Jul-15 | 3.25 uv/lb at 10V exc | 0.0 | .000325 mv/v/lb | FULL | 3000 LB | Used on AUTO50 tests 6700-6723 |
| 36 | INT LUMBAR X FORCE LB) | DENTON 1914A | 390 | 1-May-15 | 6.85 uv/lb aat 10V exc | 04-Jun-15 | 6.81 uv/in-lb at 10V exc | -0.6 | .000685 mv/v/lb | FULL | 3000 LB | Used on LARD tests 6724-6731 |
| 36 | INT LUMBAR X FORCE LB) | DENTON 1914A | 400 | 13-Mar-15 | 6.63 uv/lb at 10V exc | 05-Jun-15 | 6.65 uv/lb at 10V exc | 0.3 | .000663 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 6732-6738 |
| 37 | INT LUMBAR Y FORCE LB) | DENTON 1914A | 154 | 1-May-15 | 6.52 uv/lb at 10V exc | 5-Jun-15 | 6.49 uv/lb at 10V exc | -0.5 | .000652 mv/vlb | FULL | 3000 LB | Used on AERO50 tests 6665-6699 |
| 37 | INT LUMBAR Y FORCE LB) | DENTON 1914A | 390 | 1-May-15 | 6.70 uv/lb at 10V exc | 4-Jun-15 | 6.69 uv/lb at 10V exc | -0.2 | .000670 mv/v/lb | FULL | 3000 LB | Used on LARD tests 6724-6731 |
| 37 | INT LUMBAR Y FORCE LB) | DENTON 1914A | 400 | 13-Mar-15 | 6.69 uv/lb at 10V exc | 5-Jun-15 | 6.71 uv/in-lb at 10V exc | 0.3 | .000669 mv/v/lb | FULL | 3000 LB | Used on LOIS tests 6732-6738 |
| 38 | INT LUMBAR Z FORCE LB) | DENTON 1914A | 154 | 1-May-15 | 2.74 uv/lb at 10V exc | 5-Jun-15 | 2.73 uv/lb at 10V exc | -0.4 | .000274 mv/v/lb | FULL | 5000 LB | Used on AERO50 tests 6665-6699 |
| 38 | INT LUMBAR Z FORCE LB) | DENTON 1842 | DP1102 | 3-Dec-13 | 3.25 uv/lb at 10V exc | 21-Jul-15 | 3.25 uv/lb at 10V exc | 0.0 | .000325 mv/v/lb | FULL | 5000 LB | Used on AUTO50 tests 6700-6723 |
| 38 | INT LUMBAR Z FORCE LB) | DENTON 1914A | 390 | 1-May-15 | 2.81 uv/lb at 10V exc | 4-Jun-15 | 2.80 uv/lb at 10V exc | -0.4 | .000281 mv/v/lb | FULL | 5000 LB | Used on LARD tests 6724-6731 |
| 38 | INT LUMBAR Z FORCE LB) | DENTON 1914A | 400 | 13-Mar-15 | 2.73 uv/lb at 10V exc | 5-Jun-15 | 2.73 uv/lb at 10V exc | 0.0 | .000273 mv/v/lb | FULL | 5000 LB | Used on LOIS tests 6732-6738 |
| 39 | INT LUMBAR Mx TORQUE (IN-LB) | DENTON 1914A | 154 | 1-May-15 | 5.11 uv/in-lb at 10V exc | 05-Jun-15 | 5.14 uv/in-lb at 10V exc | 0.6 | .000511 mv/v/in-lb | FULL | 3000 IN-LB | Used on AERO50 tests 6665-6699 |
| 39 | INT LUMBAR Mx TORQUE (IN-LB) | DENTON 1914A | 390 | 1-May-15 | 5.27 uv/lb at 10V exc | 4-Jun-15 | 5.28 uv/in-lb at 10V exc | 0.2 | .000527 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 6724-6731 |
| 39 | INT LUMBAR Mx TORQUE (IN-LB) | DENTON 1914A | 400 | 13-Mar-15 | 5.19 uv/in-lb at 10V exc | 5-Jun-15 | 5.16 uv/in-lb at 10V exc | -0.6 | .000519 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 6732-6738 |
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1914A | 154 | 1-May-15 | 5.12 uv/in-lb at 10V exc | 5-Jun-15 | 5.12 uv/in-lb at 10V exc | 0.0 | .000512 mv/v/in-lb | FULL | 3000 IN-LB | Used on AERO50 tests 6665-6699 |
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1842 | DP1102 | 3-Dec-13 | 3.64 uv/in-lb at 10V exc | 21-Jul-15 | 3.67 uv/in-lb at 10V exc | 0.8 | .000364 mv/v/in-lb | FULL | 3000 IN-LB | Used on AUTO50 tests 6700-6723 |
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1914A | 390 | 1-May-15 | 5.28 uv/in-lb at 10V exc | 4-Jun-15 | 5.28 uv/in-lb at 10V exc | 0.0 | .000528 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 6724-6731 |
| 40 | INT LUMBAR My TORQUE (IN-LB) | DENTON 1914A | 400 | 13-Mar-15 | 5.16 uv/in-lb at 10V exc | 5-Jun-15 | 5.15 uv/in-lb at 10V exc | -0.2 | .000516 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 6732-6738 |
| 41 | INT LUMBAR Mz TORQUE (IN-LB) | DENTON 1914A | 154 | 1-May-15 | 8.46 uv/in-lb at 10V exc | 5-Jun-15 | 8.41 uv/in-lb at 10V excv | -0.6 | .000846 mv/v/in-lb | FULL | 3000 IN-LB | Used on AERO50 tests 6665-6699 |
| 41 | INT LUMBAR Mz TORQUE (IN-LB) | DENTON 1914A | 390 | 1-May-15 | 8.72 uv/in-lb at 10V exc | 4-Jun-15 | 8.66 uv/in-lb at 10V exc | -0.7 | .000872 mv/v/in-lb | FULL | 3000 IN-LB | Used on LARD tests 6724-6731 |

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| 41 | INT LUMBAR Mz TORQUE (IN-LB) | DENTON 1914A | 400 | 13-Mar-15 | 8.60 uv/in-lb at 10V exc | 5-Jun-15 | 8.56 uv/in-lb at 10V exc | -0.5 | .000860 mv/v/in-lb | FULL | 3000 IN-LB | Used on LOIS tests 6732-6738 |
| 42 | SLED VELOCITY (FT/SEC) | GLOBE 22A672-2 | 5 | 30-Mar-15 | 24.683 mv/ft/sec | | | | 24.683 mvft/sec | FULL | 100 FT/SEC | Used on alll tests |

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## APPENDIX B. TEST-BY TEST SUMMARY: COMPARATIVE ASSESSMENT OF RESTRAINT HARNESSESS ON THE HIA

The following is a review of the test configuration for each of the impact tests conducted on the HIA sled with a test-by-test summary documenting test conditions and a brief summary of the key data. This section of the HIA test-by-test summary reviews tests ran with LOIS and LARD; a total of 180 tests were completed with LOIS and LARD on the HIA during this program. Testing was completed in three groups: 8791 – 8908, 8992 – 9037, and 9097 - 9112

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**HIA 8791** - Cell M15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.89 G, Sled Velocity = 30.13 ft/s, Time-to-Peak = 45 ms.
**No Test –Desired conditions were not achieved due to inaccurate head X accel data.**

**HIA 8792** - Cell M15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 15.15 G, Sled Velocity = 30.65 ft/s, Time-to-Peak = 45 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8793** - Cell M12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.03 G, Sled Velocity = 29.67 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8794** - Cell M10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.12 G, Sled Velocity = 29.84 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8795** - Cell M10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.05 G, Sled Velocity = 29.61 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8796** - Cell M10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 29.58 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8797** - Cell M8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.0 G, Sled Velocity = 29.78 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8798** - Cell M6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.98 G, Sled Velocity = 26.02 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8799** - Cell N6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.91 G, Sled Velocity = 25.94 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8800** - Cell N8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 7.94 G, Sled Velocity = 29.44 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8801** - Cell N10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.86 G, Sled Velocity = 29.52 ft/s, Time-to-Peak = 53 ms.
**No Test –Desired conditions were not achieved due to failure of neck My data.**

**HIA 8802** - Cell N10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.97 G, Sled Velocity = 29.89 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8803** - Cell N10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.9 G, Sled Velocity = 29.67 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8804** - Cell N10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.93 G, Sled Velocity = 29.62 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8805** - Cell N12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 11.91 G, Sled Velocity = 29.44 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8806** - Cell N15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.74 G, Sled Velocity = 29.89 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8807** - Cell P15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 14.7 G, Sled Velocity = 30.43 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8808** - Cell P12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 11.69 G, Sled Velocity = 29.35 ft/s, Time-to-Peak = 48 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**HIA 8809** - Cell P12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.16 G, Sled Velocity = 29.96 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8810** - Cell P10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 30.28 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8811</u> -** Cell P10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.18 G, Sled Velocity = 30.51 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8812</u> -** Cell P10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.8 G, Sled Velocity = 29.77 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8813</u> -** Cell P8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 8.26 G, Sled Velocity = 30.78 ft/s, Time-to-Peak = 49 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8814</u> -** Cell P8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.92 G, Sled Velocity = 29.88 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8815</u> -** Cell P6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.01 G, Sled Velocity = 26.56 ft/s, Time-to-Peak = 41 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8816</u> -** Cell P6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 5.86 G, Sled Velocity = 26.29 ft/s, Time-to-Peak = 43 ms.
**No Test –Desired conditions were not achieved, G level not met, inaccurate neck data.**

**<u>HIA 8817</u> -** Cell P6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.07 G, Sled Velocity = 27.05 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8818** - Cell P8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.91 G, Sled Velocity = 30.36 ft/s, Time-to-Peak = 56 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8819** - Cell P10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.28 G, Sled Velocity = 31.56 ft/s, Time-to-Peak = 52 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**HIA 8820** - Cell P10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.89 G, Sled Velocity = 30.6 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8821** - Cell P10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.04 G, Sled Velocity = 30.95 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8822** - Cell P10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 30.79 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8823** - Cell P12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 11.96 G, Sled Velocity = 30.92 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8824** - Cell P15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 14.63 G, Sled Velocity = 31.06 ft/s, Time-to-Peak = 43 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**HIA 8825** - Cell P15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.31 G, Sled Velocity = 32.05 ft/s, Time-to-Peak = 43 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**HIA 8826** - Cell P15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.01 G, Sled Velocity = 31.81 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8827** - Cell M15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.96 G, Sled Velocity = 31.66 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8828** - Cell M12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.05 G, Sled Velocity = 30.97 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8829** - Cell M10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.15 G, Sled Velocity = 31.25 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8830** - Cell M10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.99 G, Sled Velocity = 30.91 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8831** - Cell M10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.09 G, Sled Velocity = 31.09 ft/s, Time-to-Peak = 45 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8832** - Cell M8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.08 G, Sled Velocity = 30.91 ft/s, Time-to-Peak = 47 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8833** - Cell M6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 6.08 G, Sled Velocity = 26.69 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8834** - Cell N6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 6.11 G, Sled Velocity = 27.08 ft/s, Time-to-Peak = 41 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8835** - Cell N8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 7.83 G, Sled Velocity = 30.29 ft/s, Time-to-Peak = 57 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**HIA 8836** - Cell N8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.13 G, Sled Velocity = 31.28 ft/s, Time-to-Peak = 57 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8837** - Cell N10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.10 G, Sled Velocity = 30.94 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8838** - Cell N10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.07 G, Sled Velocity = 31.03 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8839</u>** - Cell N10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.06 G, Sled Velocity = 30.9 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8840</u>** - Cell N12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 11.96 G, Sled Velocity = 30.57 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8841</u>** - Cell N15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.98 G, Sled Velocity = 31.7 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8842</u>** - Cell S6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 6.21 G, Sled Velocity = 24.68 ft/s, Time-to-Peak = 51 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8843</u>** - Cell S6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.52 G, Sled Velocity = 22.89 ft/s, Time-to-Peak = 50 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**<u>HIA 8844</u>** - Cell S6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.98 G, Sled Velocity = 24.37 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8845</u>** - Cell S8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.23 G, Sled Velocity = 30.27 ft/s, Time-to-Peak = 44 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8846</u> -** Cell S8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 7.98 G, Sled Velocity = 29.52 ft/s, Time-to-Peak = 46 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8847</u> -** Cell S10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 29.58 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8848</u> -** Cell S10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.86 G, Sled Velocity = 29.3 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8849</u> -** Cell S10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.91 G, Sled Velocity = 29.39 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8850</u> -** Cell S12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 11.72 G, Sled Velocity = 29.15 ft/s, Time-to-Peak = 39 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**<u>HIA 8851</u> -** Cell S12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.02 G, Sled Velocity = 29.61 ft/s, Time-to-Peak = 39 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8852</u> -** Cell S15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.54 G, Sled Velocity = 29.83 ft/s, Time-to-Peak = 37 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**<u>HIA 8853</u> -** Cell S15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 15.06 G, Sled Velocity = 30.58 ft/s, Time-to-Peak = 46 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8854</u> -** Cell T15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.99 G, Sled Velocity = 30.4 ft/s, Time-to-Peak = 47 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8855</u> -** Cell T12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.21 G, Sled Velocity = 30.21 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8856</u> -** Cell T10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.15 G, Sled Velocity = 30.09 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8857</u> -** Cell T10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 29.92 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8858</u> -** Cell T10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.06 G, Sled Velocity = 30.13 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8859</u> -** Cell T8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.01 G, Sled Velocity = 29.76 ft/s, Time-to-Peak = 59 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8860</u>** - Cell T6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.93 G, Sled Velocity = 25.27 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8861</u>** - Cell S6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.90 G, Sled Velocity = 25.95 ft/s, Time-to-Peak = 59 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8862</u>** - Cell S8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 7.93 G, Sled Velocity = 29.95 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8863</u>** - Cell S10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.8 G, Sled Velocity = 30.12 ft/s, Time-to-Peak = 40 ms.
**No Test –Desired conditions were not achieved, chest Z accel broke during impact event.**

**<u>HIA 8864</u>** - Cell S10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.87 G, Sled Velocity = 30.18 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8865</u>** - Cell S10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.04 G, Sled Velocity = 30.71 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8866</u>** - Cell S10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 30.66 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8867** - Cell S12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 11.86 G, Sled Velocity = 29.79 ft/s, Time-to-Peak = 37 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8868** - Cell S15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.97 G, Sled Velocity = 30.71 ft/s, Time-to-Peak = 35 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8869** - Cell T15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.83 G, Sled Velocity = 31.2 ft/s, Time-to-Peak = 34 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8870** - Cell T12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.13 G, Sled Velocity = 30.93 ft/s, Time-to-Peak = 36 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8871** - Cell T10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.8 G, Sled Velocity = 30.13 ft/s, Time-to-Peak = 39 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8872** - Cell T10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.97 G, Sled Velocity = 30.69 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8873** - Cell T10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.06 G, Sled Velocity = 30.93 ft/s, Time-to-Peak = 39 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8874</u>** - Cell T8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 7.99 G, Sled Velocity = 30.43 ft/s, Time-to-Peak = 58 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8875</u>** - Cell T6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.78 G, Sled Velocity = 25.14 ft/s, Time-to-Peak = 65 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**<u>HIA 8876</u>** - Cell T6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 5.94 G, Sled Velocity = 25.59 ft/s, Time-to-Peak = 64 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8877</u>** - Cell U6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 5.75 G, Sled Velocity = 25.08 ft/s, Time-to-Peak = 58 ms.
**No Test –Desired conditions were not achieved; G level not met, channels off.**

**<u>HIA 8878</u>** - Cell U6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.14 G, Sled Velocity = 26.22 ft/s, Time-to-Peak = 64 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8879</u>** - Cell U6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 5.99 G, Sled Velocity = 25.72 ft/s, Time-to-Peak = 60 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8880</u>** - Cell U8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.91 G, Sled Velocity = 29.97 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8881** - Cell U10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.12 G, Sled Velocity = 30.79 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8882** - Cell U10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.07 G, Sled Velocity = 30.7 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8883** - Cell U10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.01 G, Sled Velocity = 30.62 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8884** - Cell U12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.06 G, Sled Velocity = 30.78 ft/s, Time-to-Peak = 37 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8885** - Cell U15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.03 G, Sled Velocity = 31.4 ft/s, Time-to-Peak = 34 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8886** - Cell V15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.11 G, Sled Velocity = 31.54 ft/s, Time-to-Peak = 34 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8887** - Cell V12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 11.97 G, Sled Velocity = 30.53 ft/s, Time-to-Peak = 37 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8888</u>** - Cell V10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.09 G, Sled Velocity = 30.81 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8889</u>** - Cell V10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.95 G, Sled Velocity = 30.66 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8890</u>** - Cell V10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.11 G, Sled Velocity = 30.99 ft/s, Time-to-Peak = 50 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8891</u>** - Cell V8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.96 G, Sled Velocity = 30.0 ft/s, Time-to-Peak = 59 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8892</u>** - Cell V6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.08 G, Sled Velocity = 25.97 ft/s, Time-to-Peak = 65 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8893</u>** - Cell U6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.17 G, Sled Velocity = 25.79 ft/s, Time-to-Peak = 55 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8894</u>** - Cell U6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.11 G, Sled Velocity = 25.71 ft/s, Time-to-Peak = 55 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8895</u> -** Cell U8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.95 G, Sled Velocity = 29.71 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA8896</u> -** Cell U10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 30.07 ft/s, Time-to-Peak = 38 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8897</u> -** Cell U10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 29.92 ft/s, Time-to-Peak = 38 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8898</u> -** Cell U10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.93 G, Sled Velocity = 29.88 ft/s, Time-to-Peak = 40 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8899</u> -** Cell U12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.17 G, Sled Velocity = 29.92 ft/s, Time-to-Peak = 36 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8900</u> -** Cell U15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.28 G, Sled Velocity = 30.08 ft/s, Time-to-Peak = 34 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8901</u> -** Cell V15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 15.01 G, Sled Velocity = 30.05 ft/s, Time-to-Peak = 34 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8902** - Cell V12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.07 G, Sled Velocity = 29.71 ft/s, Time-to-Peak = 36 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8903** - Cell V10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.13 G, Sled Velocity = 30.42 ft/s, Time-to-Peak = 38 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8904** - Cell V10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.9 G, Sled Velocity = 29.91 ft/s, Time-to-Peak = 39 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8905** - Cell V10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 9.96 G, Sled Velocity = 30.11 ft/s, Time-to-Peak = 39 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8906** - Cell V8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.94 G, Sled Velocity = 29.83 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8907** - Cell V6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.19 G, Sled Velocity = 26.33 ft/s, Time-to-Peak = 56 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8908** - Cell V6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.06 G, Sled Velocity = 25.89 ft/s, Time-to-Peak = 57 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**BREAK IN TESTING… CONTINUED WITH TEST 8982**

**<u>HIA 8982</u> -** Cell ON6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 5.93 G, Sled Velocity = 25.62 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8983</u> -** Cell ON8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 7.76 G, Sled Velocity = 29.42 ft/s, Time-to-Peak = 48 ms.
**No Test –Desired conditions were not achieved, G level not met.**

**<u>HIA 8984</u> -** Cell ON8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 8.08 G, Sled Velocity = 30.22 ft/s, Time-to-Peak = 46 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8985</u> -** Cell ON10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 10.27 G, Sled Velocity = 30.84 ft/s, Time-to-Peak = 51 ms.
**No Test –Desired conditions were not achieved, G level too high.**

**<u>HIA 8986</u> -** Cell ON10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 9.96 G, Sled Velocity = 30.25 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8987</u> -** Cell ON10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 10.07 G, Sled Velocity = 30.43 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 8988</u> -** Cell ON10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 9.94 G, Sled Velocity = 30.21 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8989** - Cell ON12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 11.97 G, Sled Velocity = 30.25 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8990** - Cell ON15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 14.9 G, Sled Velocity = 30.72 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8991** - Cell ON15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 15.37 G, Sled Velocity = 30.69 ft/s, Time-to-Peak = 44 ms.
**No Test –Desired conditions were not achieved; G level too high, lap loads maxed out.**

**HIA 8992** - Cell ON15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 15.24 G, Sled Velocity = 30.81 ft/s, Time-to-Peak = 44 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8993** - Cell ON12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 12.51 G, Sled Velocity = 30.66 ft/s, Time-to-Peak = 48 ms.
**No Test –Desired conditions were not achieved; G level too high.**

**HIA 8994** - Cell ON12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 11.97 G, Sled Velocity = 29.68 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8995** - Cell ON10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 9.76 G, Sled Velocity = 29.13 ft/s, Time-to-Peak = 52 ms.
**No Test –Desired conditions were not achieved; G level not met.**

**HIA 8996** - Cell ON10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 10.24 G, Sled Velocity = 30.17 ft/s, Time-to-Peak = 51 ms.
**No Test –Desired conditions were not achieved; G level too high.**

**HIA 8997** - Cell ON10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 9.89 G, Sled Velocity = 29.36 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8998** - Cell ON10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 9.99 G, Sled Velocity = 29.46 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 8999** - Cell ON10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 29.66 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9000** - Cell ON8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 8.1 G, Sled Velocity = 29.73 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9001** - Cell ON6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: None.
Input summary: Sled X Accel. = 6.13 G, Sled Velocity = 25.62 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9002** - Cell Q6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.23 G, Sled Velocity = 26.16 ft/s, Time-to-Peak = 51 ms.
**No Test –Desired conditions were not achieved; G level too high.**

**HIA 9003** - Cell Q6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 5.96 G, Sled Velocity = 25.77 ft/s, Time-to-Peak = 55 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9004** - Cell Q8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 7.79 G, Sled Velocity = 29.12 ft/s, Time-to-Peak = 47 ms. **No Test –Desired conditions were not achieved; G level not met.**

**HIA 9005** - Cell Q8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 8.46 G, Sled Velocity = 31.18 ft/s, Time-to-Peak = 56 ms. **No Test –Desired conditions were not achieved; G level too high.**

**HIA 9006** - Cell Q8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 8.16 G, Sled Velocity = 30.13 ft/s, Time-to-Peak = 48 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9007** - Cell Q10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 9.79 G, Sled Velocity = 29.67 ft/s, Time-to-Peak = 44 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9008** - Cell Q10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 29.97 ft/s, Time-to-Peak = 44 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9009** - Cell Q10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 9.98 G, Sled Velocity = 29.87 ft/s, Time-to-Peak = 51 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9010** - Cell Q12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 11.88 G, Sled Velocity = 29.8 ft/s, Time-to-Peak = 49 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9011</u> -** Cell Q15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 15.07 G, Sled Velocity = 30.9 ft/s, Time-to-Peak = 44 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9012</u> -** Cell Q15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 14.83 G, Sled Velocity = 31.5 ft/s, Time-to-Peak = 43 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9013</u> -** Cell Q12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 12.0 G, Sled Velocity = 30.96 ft/s, Time-to-Peak = 49 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9014</u> -** Cell Q10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 9.70 G, Sled Velocity = 30.0 ft/s, Time-to-Peak = 52 ms. **No Test –Desired conditions were not achieved; G level not met.**

**<u>HIA 9015</u> -** Cell Q10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 10.12 G, Sled Velocity = 30.97 ft/s, Time-to-Peak = 51 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9016</u> -** Cell Q10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 30.76 ft/s, Time-to-Peak = 51 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9017</u> -** Cell Q10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB. Input summary: Sled X Accel. = 9.95 G, Sled Velocity = 30.5 ft/s, Time-to-Peak = 51 ms. **Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9018** - Cell Q8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 7.96 G, Sled Velocity = 30.36 ft/s, Time-to-Peak = 56 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9019** - Cell Q6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 5.95 G, Sled Velocity = 26.06 ft/s, Time-to-Peak = 41 ms.
**No Test –Desired conditions were not achieved; G level not met.**

**HIA 9020** - Cell Q6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.12 G, Sled Velocity = 26.02 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9021** - Cell W8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 8.17 G, Sled Velocity = 30.77 ft/s, Time-to-Peak = 54 ms.
**No Test –Desired conditions were not achieved; G level too high.**

**HIA 9022** - Cell W6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.07 G, Sled Velocity = 25.93 ft/s, Time-to-Peak = 56 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9023** - Cell W8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 8.0 G, Sled Velocity = 30.26 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9024** - Cell W10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.12 G, Sled Velocity = 31.29 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9025** - Cell W10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.05 G, Sled Velocity = 30.74 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9026** - Cell W10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.10 G, Sled Velocity = 30.79 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9027** - Cell W12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.16 G, Sled Velocity = 31.55 ft/s, Time-to-Peak = 46 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9028** - Cell W15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 14.61 G, Sled Velocity = 31.03 ft/s, Time-to-Peak = 43 ms.
**No Test –Desired conditions were not achieved; G level not met.**

**HIA 9029** - Cell W15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 14.73 G, Sled Velocity = 31.23 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9030** - Cell W15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 14.92 G, Sled Velocity = 30.8 ft/s, Time-to-Peak = 42 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9031** - Cell W12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 12.18 G, Sled Velocity = 30.6 ft/s, Time-to-Peak = 46 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9032** - Cell W10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.24 G, Sled Velocity = 30.62 ft/s, Time-to-Peak = 48 ms.
**No Test –Desired conditions were not achieved; G level too high.**

**HIA 9033** - Cell W10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.05 G, Sled Velocity = 30.16 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA9034** - Cell W10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.02 G, Sled Velocity = 30.07 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9035** - Cell W10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 30.11 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9036** - Cell W8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 8.07 G, Sled Velocity = 30.04 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA9037** - Cell W6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x/+z-axis impact, 45º offset, headrest extended 2.5” forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: MB.
Input summary: Sled X Accel. = 6.02 G, Sled Velocity = 25.56 ft/s, Time-to-Peak = 51 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**BREAK IN TESTING… CONTINUED WITH TEST 9097**

**HIA 9097** - Cell O6, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 6.14 G, Sled Velocity = 25.2 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9098** - Cell O8, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.12 G, Sled Velocity = 29.61 ft/s, Time-to-Peak = 57 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9099** - Cell O10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.18 G, Sled Velocity = 29.58 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9100** - Cell O10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.09 G, Sled Velocity = 29.35 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9101** - Cell O10, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.05 G, Sled Velocity = 29.33 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9102** - Cell O12, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.16 G, Sled Velocity = 28.84 ft/s, Time-to-Peak = 49 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9103** - Cell O15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 15.10 G, Sled Velocity = 30.17 ft/s, Time-to-Peak = 45 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9104</u> -** Cell O15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.66 G, Sled Velocity = 30.53 ft/s, Time-to-Peak = 45 ms.
**No Test –Desired conditions were not achieved; G level not met.**

**<u>HIA 9105</u> -** Cell O15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 14.69 G, Sled Velocity = 30.82 ft/s, Time-to-Peak = 45 ms.
**No Test –Desired conditions were not achieved; G level not met.**

**<u>HIA 9106</u> -** Cell O15, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 15 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 15.15 G, Sled Velocity = 31.4 ft/s, Time-to-Peak = 45 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9107</u> -** Cell O12, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 12 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 12.15 G, Sled Velocity = 30.47 ft/s, Time-to-Peak = 48 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9108</u> -** Cell O10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.87 G, Sled Velocity = 30.15 ft/s, Time-to-Peak = 53 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9109</u> -** Cell O10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 9.99 G, Sled Velocity = 30.09 ft/s, Time-to-Peak = 52 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**<u>HIA 9110</u> -** Cell O10, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 10 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 10.03 G, Sled Velocity = 30.19 ft/s, Time-to-Peak = 54 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9111** - Cell O8, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 8 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 8.11 G, Sled Velocity = 30.37 ft/s, Time-to-Peak = 57 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

**HIA 9112** - Cell O6, HIA Pin 10; SUBJECT: LOIS manikin; IMPACT: 6 G; CONFIGURATION: –x-axis impact, Zero degree offset, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II.
Input summary: Sled X Accel. = 6.04 G, Sled Velocity = 25.77 ft/s, Time-to-Peak = 43 ms.
**Successful Test – All electronic data channels were present and continuous, data was successfully collected, desired test condition was achieved.**

## APPENDIX C. SAMPLE DATA SHEETS

Examples of test data collected during the program will show the post-test processed data for the different data sets used for the comparative assessments including baseline, headrest, helmet, harness, combined equipment, and seat tilt configurations. A 15 G test will be shown for each test configuration, and are identified below.

### <u>BASELINE I TEST CONFIGURATIONS: SEAT FIXTURE VERTICAL (UPRIGHT)</u>

#### HIA Parametric Assessment: Baseline (pages 122-139)

- **<u>HIA 8792</u>** - Cell M15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: –X-axis impact, Seatback upright, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II. Input summary: Sled X Accel. = 15.15 G

#### HIA Parametric Assessment: Headrest Forward (pages 140-157)

- **<u>HIA 8806</u>** - Cell N15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X-axis impact, Seatback upright, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II. Input summary: Sled X Accel. = 14.74 G

#### HIA Parametric Assessment: Heavy Helmet (pages 158-174)

- **<u>HIA 9103</u>** - Cell O15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X-axis impact, Seat Upright, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: ACES II. Input summary: Sled X Accel. = 15.10 G

#### HIA Parametric Assessment: Seat Mounted Harness (pages 175-192)

- **<u>HIA 8807</u>** - Cell P15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X-axis impact, Seat Upright, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: Martin Baker. Input summary: Sled X Accel. = 14.7 G

#### HIA Parametric Assessment: JSF-Style Seat Configuration (pages 193-209)

- **<u>HIA 9011</u>** - Cell Q15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X-axis impact, Seat upright, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: Martin Baker. Input summary: Sled X Accel. = 15.07 G

### <u>BASELINE I TEST CONFIGURATIONS: SEAT FIXTURE RECLINED (45°)</u>

**HIA Parametric Assessment: Baseline (pages 210-226)**

- **<u>HIA 8853</u>** - Cell S15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X/+Z-axis impact, 45º reclined seat, seatback and headrest inline; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II. Input summary: Sled X Accel. = 15.06 G

**HIA Parametric Assessment: Headrest Forward (pages 227-243)**

- **<u>HIA 8854</u>** - Cell T15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X/+Z-axis impact, 45º reclined seat, headrest extended 2.5" forward from seatback; RESTRAINT: Torso Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: ACES II. Input summary: Sled X Accel. = 14.99 G

**HIA Parametric Assessment: Seat Mounted Harness (pages 244-260)**

- **<u>HIA 8900</u>** - Cell U15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X/+Z-axis impact, 45º reclined seat, seatback and headrest inline; RESTRAINT: Simplified Combined Harness; HELMET/MASK: HGU-55/P, MBU-20P; SEAT CUSHION: Martin Baker. Input summary: Sled X Accel. = 15.28 G

**HIA Parametric Assessment: JSF-Style Seat Configuration (pages 261-277)**

- **<u>HIA 9030</u>** - Cell W15, HIA Pin 10; SUBJECT: LARD manikin; IMPACT: 15 G; CONFIGURATION: -X/+z-axis impact, 45º reclined seat, headrest extended 2.5" forward from seatback; RESTRAINT: Simplified Combined Harness; HELMET/MASK: F-35 Gen II, MBU-20P; SEAT CUSHION: Martin Baker. Input summary: Sled X Accel. = 14.92 G

201404 Test: 8792 Test Date: 140602 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: M15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 8.0 | |
| Impact Rise Time (Ms) | | | | 45.0 | |
| Impact Duration (Ms) | | | | 109.0 | |
| Velocity Change (Ft/Sec) | | 30.65 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.04 | 15.15 | -0.87 | 45.0 | 113.0 |
| SLED Y ACCEL (G) | 0.00 | 0.63 | -0.73 | 32.0 | 40.0 |
| SLED Z ACCEL (G) | 1.00 | 3.25 | -1.80 | 33.0 | 38.0 |
| SLED VELOCITY (FT/SEC) | 0.18 | 29.62 | 0.22 | 116.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.65 | 0.03 | 109.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.04 | 2.26 | -16.46 | 123.0 | 33.0 |
| SEAT Y ACCEL (G) | 0.00 | 1.75 | -1.34 | 148.0 | 49.0 |
| SEAT Z ACCEL (G) | 1.00 | 5.70 | -4.25 | 52.0 | 40.0 |
| SEAT RESULTANT | 1.01 | 17.38 | 0.36 | 52.0 | 145.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -2.33 | -2.02 | -558.91 | 2.0 | 72.0 |
| LEFT LAP Y FORCE (LB) | 2.99 | 382.80 | 2.94 | 67.0 | 0.0 |
| LEFT LAP Z FORCE (LB) | -15.11 | -1.94 | -1887.81 | 198.0 | 68.0 |
| LEFT LAP RESULTANT (LB) | 15.58 | 1999.93 | 4.85 | 69.0 | 195.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -2.74 | -0.96 | -650.13 | 186.0 | 69.0 |
| RIGHT LAP Y FORCE (LB) | 4.59 | 14.74 | -194.18 | 43.0 | 71.0 |
| RIGHT LAP Z FORCE (LB) | -24.03 | -6.94 | -1977.76 | 208.0 | 61.0 |
| RIGHT LAP RESULTANT (LB) | 24.62 | 2090.57 | 8.25 | 70.0 | 208.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -20.50 | -6.81 | -1160.84 | 195.0 | 72.0 |
| LEFT SHOULDER Y FORCE (LB) | 3.73 | 26.43 | -11.19 | 54.0 | 117.0 |
| LEFT SHOULDER Z FORCE (LB) | 4.77 | 314.04 | 1.02 | 78.0 | 185.0 |
| LEFT SHOULDER RESULTANT (LB) | 21.38 | 1195.71 | 7.40 | 73.0 | 196.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -15.36 | -3.49 | -1133.23 | 195.0 | 71.0 |
| RIGHT SHOULDER Y FORCE (LB) | -0.98 | 3.78 | -206.50 | 188.0 | 75.0 |
| RIGHT SHOULDER Z FORCE (LB) | 2.70 | 45.29 | -1.98 | 64.0 | 147.0 |
| RIGHT SHOULDER RESULTANT (LB | 15.63 | 1148.95 | 3.81 | 71.0 | 195.0 |
| | | | | | |
| CROTCH STRAP X FORCE (LB) | 1.33 | 2.33 | -8.13 | 123.0 | 31.0 |
| CROTCH STRAP Y FORCE (LB) | -1.10 | 0.55 | -2.44 | 66.0 | 80.0 |
| CROTCH STRAP Z FORCE (LB) | -2.07 | 7.66 | -7.47 | 80.0 | 51.0 |
| CROTCH STRAP FORCE (LB) | 2.70 | 9.03 | 1.38 | 52.0 | 185.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | 0.00 | 3.34 | -24.19 | 205.0 | 112.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 4.22 | -0.88 | 112.0 | 208.0 |

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201404 Test: 8792 Test Date: 140602 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: M15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT HEAD Z ACCEL (G) | 0.98 | 8.85 | -23.33 | 92.0 | 64.0 |
| INT HEAD RESULTANT (G) | 0.98 | 27.16 | 0.38 | 64.0 | 21.0 |
| INT HEAD HIC | | 77.31 | | 58.0 | 88.0 |
| INT HEAD Ry ANG (RAD/SEC2) | 3.94 | 992.94 | -1607.55 | 55.0 | 91.0 |
| | | | | | |
| INT NECK X FORCE (LB) | 4.75 | 60.22 | -331.39 | 204.0 | 113.0 |
| INT NECK Y FORCE (LB) | -3.32 | 12.44 | -70.20 | 205.0 | 113.0 |
| INT NECK Z FORCE (LB) | -3.60 | 250.63 | -47.98 | 72.0 | 88.0 |
| INT NECK RESULTANT (LB) | 6.83 | 362.61 | 4.30 | 114.0 | 17.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 4.79 | 40.77 | -102.51 | 83.0 | 119.0 |
| INT NECK My TORQUE (IN-LB) | -5.45 | -5.63 | -124.02 | 6.0 | 52.0 |
| INT NECK Mz TORQUE (IN-LB) | -4.44 | 14.24 | -35.89 | 88.0 | 127.0 |
| INT NECK TORQUE RES (IN-LB) | 8.52 | 127.50 | 8.81 | 52.0 | 0.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | 0.00 | 3.54 | -25.12 | 208.0 | 69.0 |
| INT CHEST Y ACCEL (G) | -0.01 | 0.42 | -4.89 | 101.0 | 74.0 |
| INT CHEST Z ACCEL (G) | 0.99 | 16.76 | -10.25 | 91.0 | 64.0 |
| INT CHEST RESULTANT (G) | 0.99 | 25.83 | 0.66 | 68.0 | 19.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.03 | 7.54 | -30.97 | 206.0 | 65.0 |
| INT LUMBAR Y ACCEL (G) | 0.01 | 9.36 | -4.40 | 61.0 | 80.0 |
| INT LUMBAR Z ACCEL (G) | 1.00 | 30.87 | -7.14 | 73.0 | 58.0 |
| INT LUMBAR RESULTANT (G) | 1.00 | 40.98 | 0.33 | 73.0 | 169.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | -1.25 | 183.56 | -315.96 | 65.0 | 95.0 |
| INT LUMBAR Y FORCE (LB) | -7.96 | 55.24 | -110.24 | 89.0 | 66.0 |
| INT LUMBAR Z FORCE (LB) | -44.37 | 162.37 | -1356.60 | 140.0 | 89.0 |
| INT LUMBAR FORCE RESULTANT ( | 45.10 | 1380.30 | 14.74 | 89.0 | 20.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 5.59 | 202.13 | -486.83 | 97.0 | 71.0 |
| INT LUMBAR My TORQUE (IN-LB) | -42.52 | 624.32 | -1741.14 | 65.0 | 97.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | 0.39 | 25.52 | -0.73 | 74.0 | 28.0 |
| INT LUMBAR TORQUE RESULTANT | 42.89 | 1752.85 | 3.16 | 97.0 | 20.0 |

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201404 Test: 8792 Test Date: 140602 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: M15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 60.22 | -331.39 | 204.0 | 113.0 |
| NIJ TENSION (LB) | | 250.63 | | 72.0 | |
| NIJ COMPRESSION (LB) | | -47.98 | | 88.0 | |
| NIJ FLEXION (IN-LB) | | 174.76 | | 113.0 | |
| NIJ EXTENSION (IN-LB) | | 99.23 | | 203.0 | |
| NIJ NTF | 0.0000 | 0.1505 | 0.0000 | 72.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.1072 | 0.0000 | 52.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.0543 | 0.0000 | 88.0 | 0.0 |
| NIJ NCE | 0.0077 | 0.0091 | 0.0000 | 8.0 | 16.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.13 | | | |
| NIJ NTF AIS >= 3 | | 0.05 | | | |
| NIJ NTF AIS >= 4 | | 0.07 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.13 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.07 | | | |
| NIJ NTE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.12 | | | |
| NIJ NCF AIS >= 3 | | 0.04 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.11 | | | |
| NIJ NCE AIS >= 3 | | 0.04 | | | |
| NIJ NCE AIS >= 4 | | 0.06 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0030 | 0.0647 | 0.0003 | 119.0 | 169.0 |
| NMIz | 0.0000 | 0.0000 | 0.0000 | 0.0 | 0.0 |

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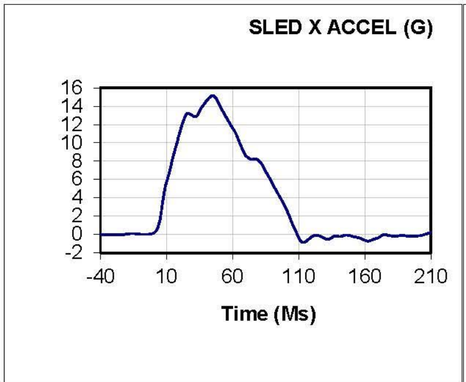
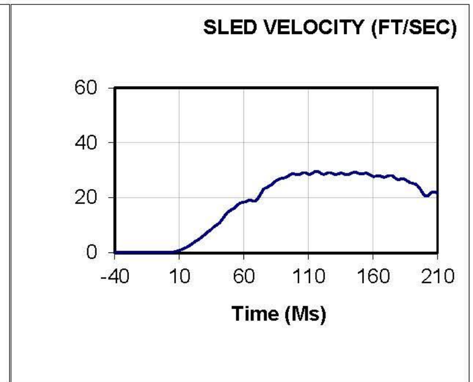
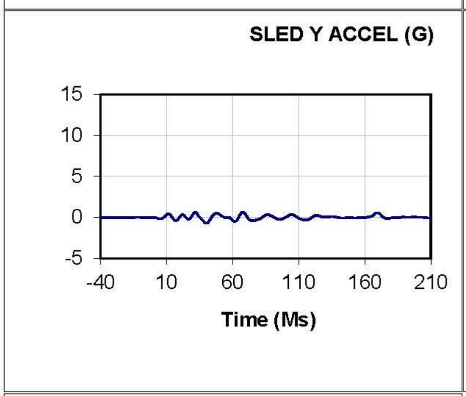
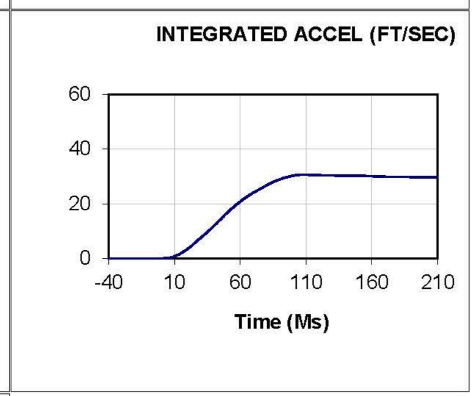
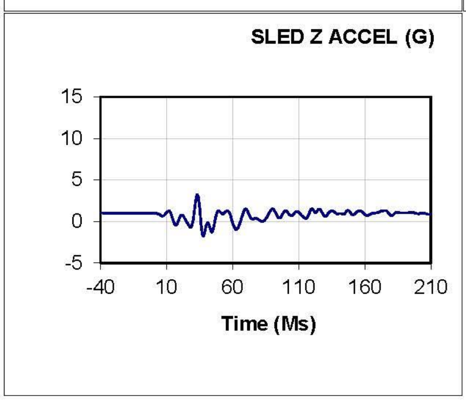
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15



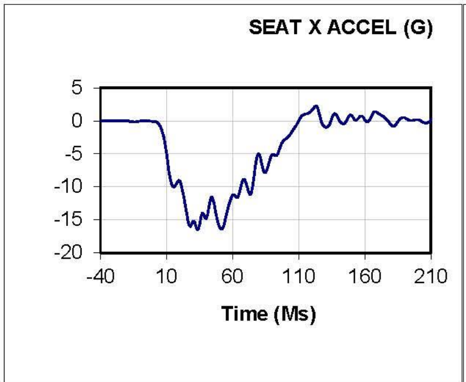



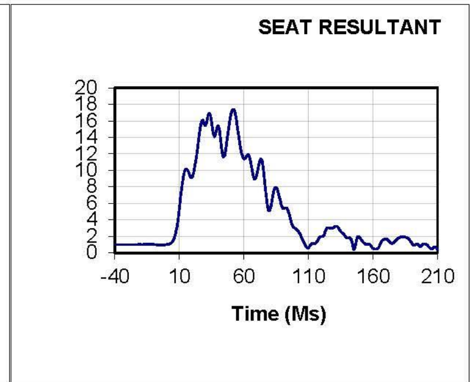



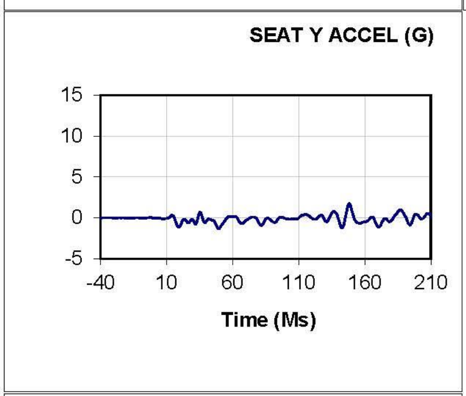



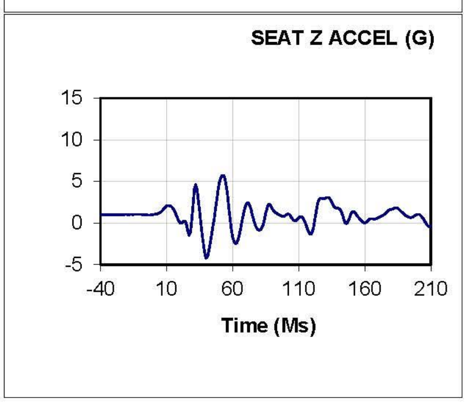



201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

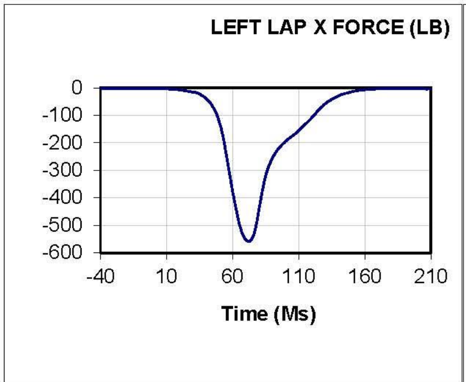


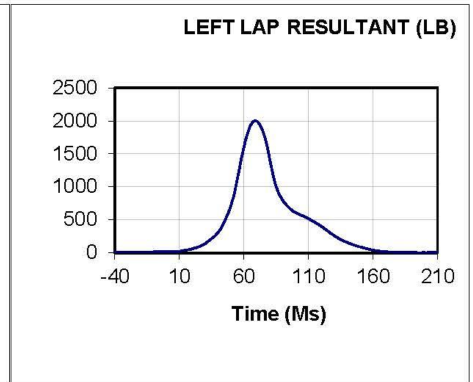



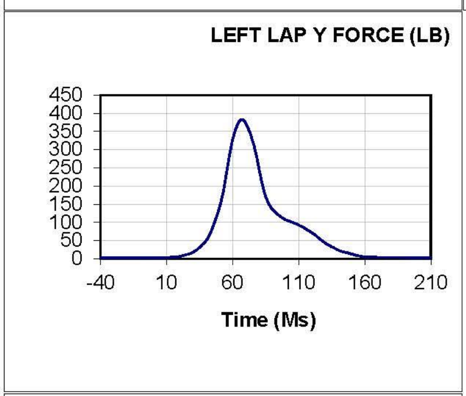



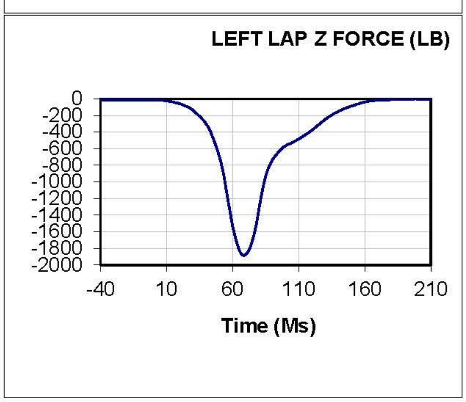



201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

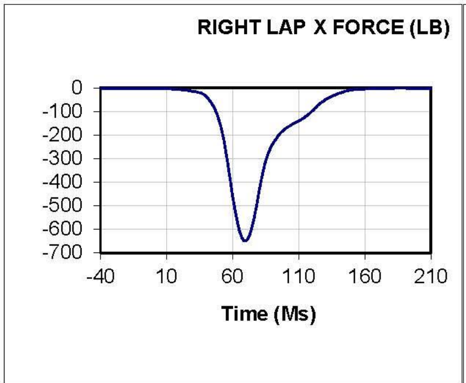


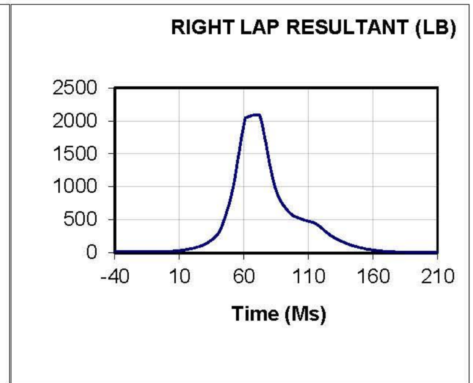



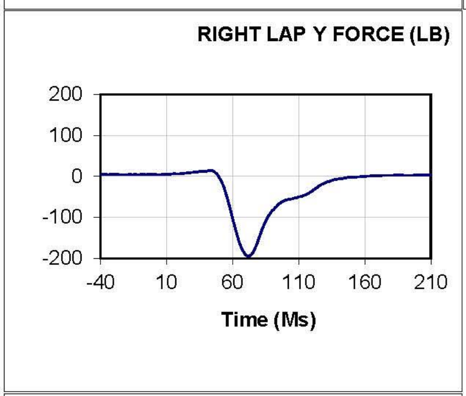



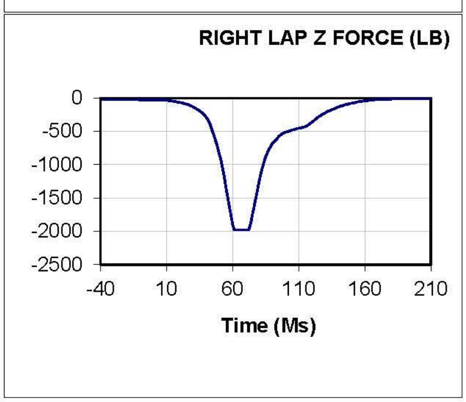



201404  Test: 8792  Test Date: 140602  Subj: LARD  Cell: M15

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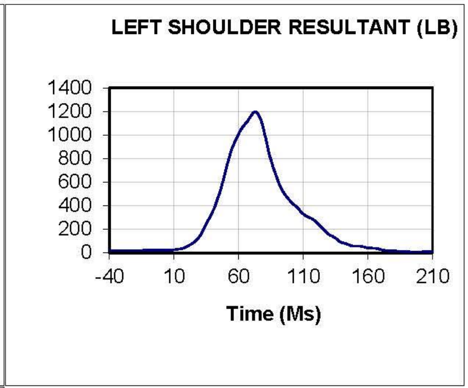
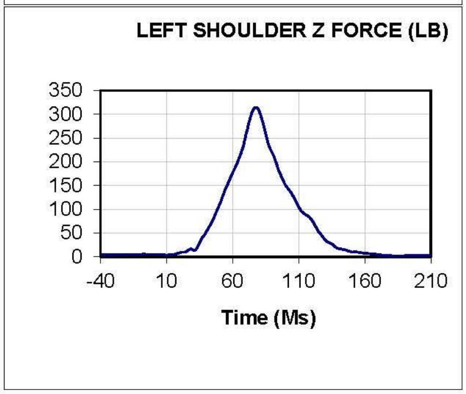
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15



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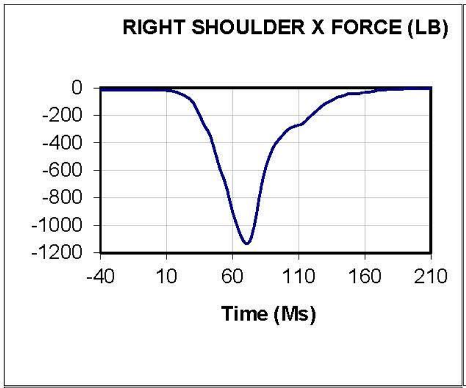
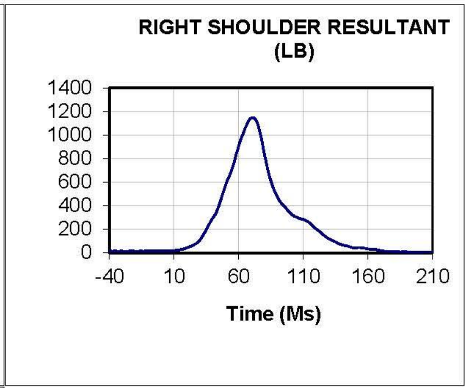
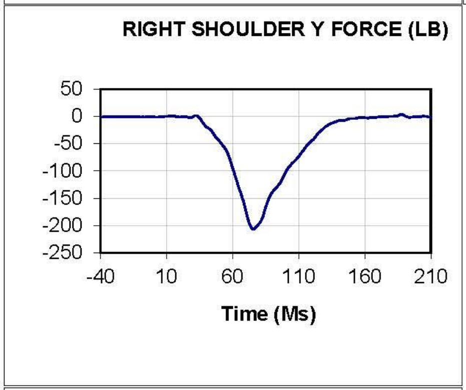
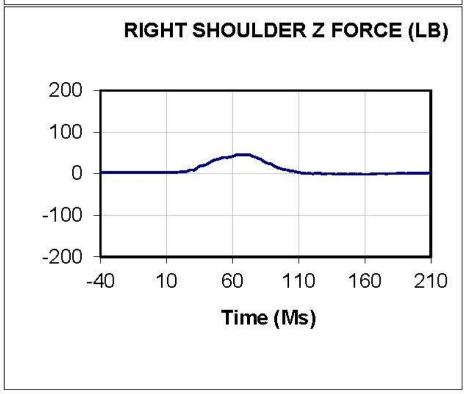
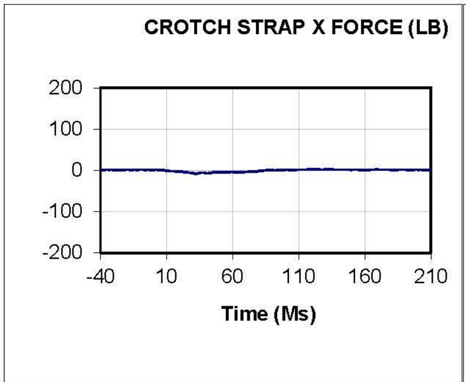

RIGHT SHOULDER X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-40
10
60
110
160
210
Time (Ms)

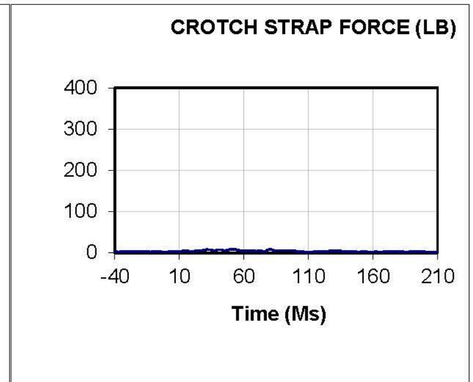

RIGHT SHOULDER RESULTANT (LB)
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
210
Time (Ms)

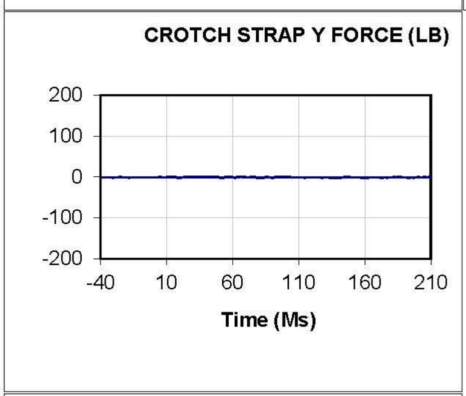

RIGHT SHOULDER Y FORCE (LB)
50
0
-50
-100
-150
-200
-250
-40
10
60
110
160
210
Time (Ms)

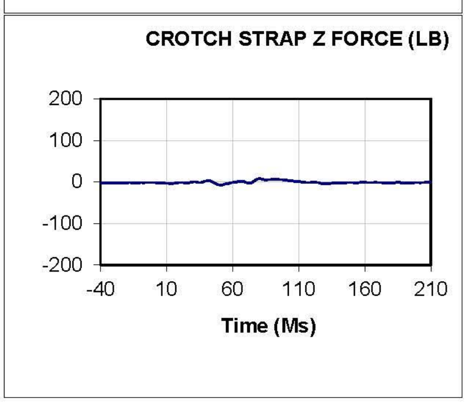

RIGHT SHOULDER Z FORCE (LB)
200
100
0
-100
-200
-40
10
60
110
160
210
Time (Ms)

201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

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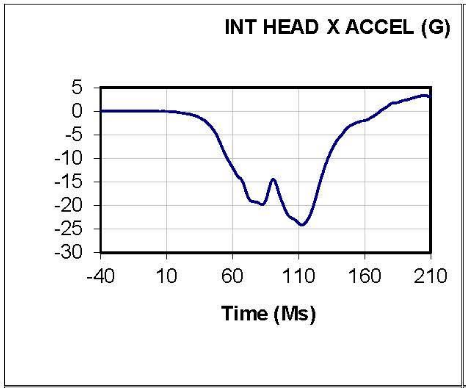
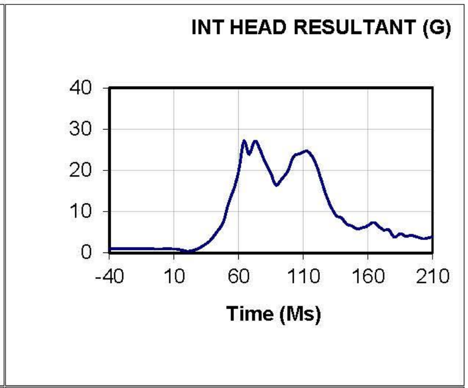
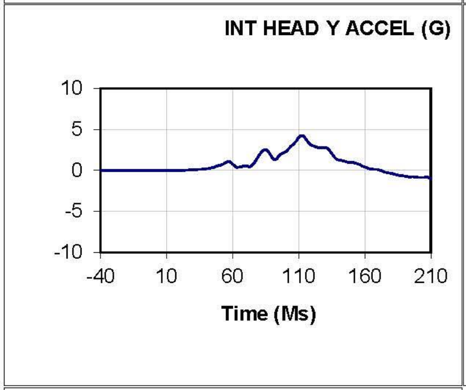
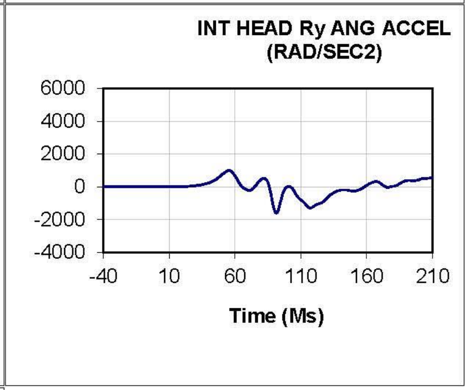
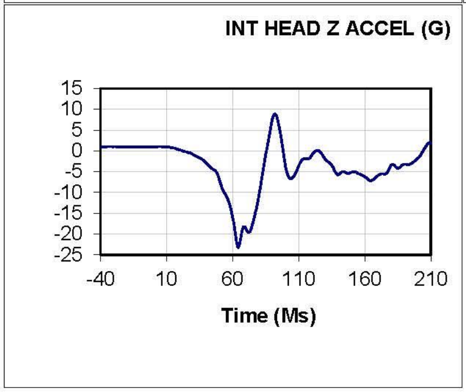
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

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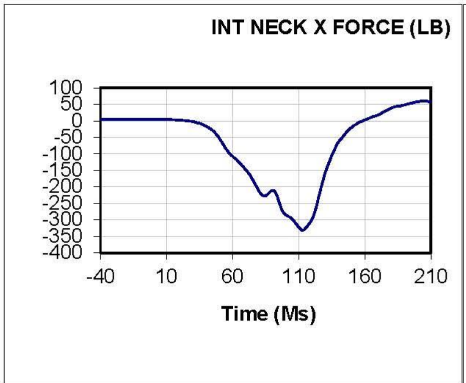
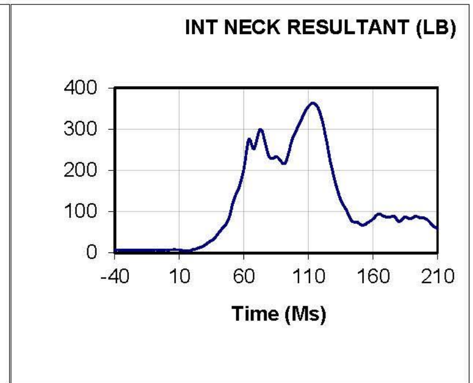
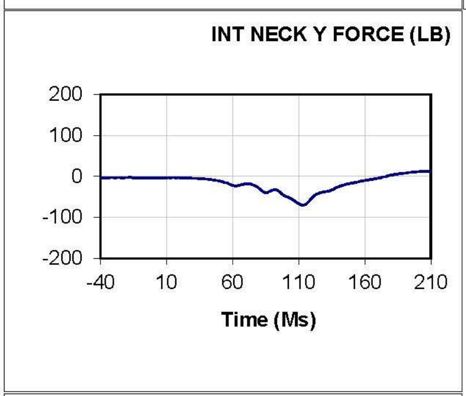
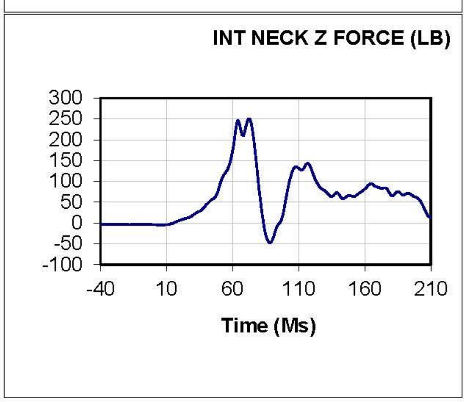
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

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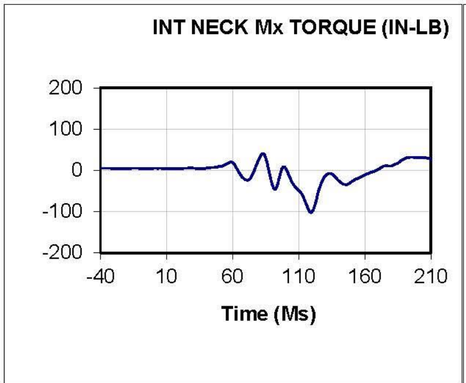
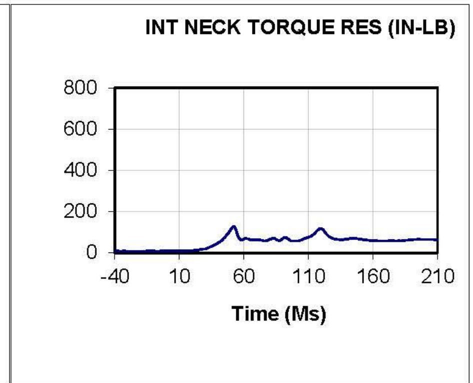
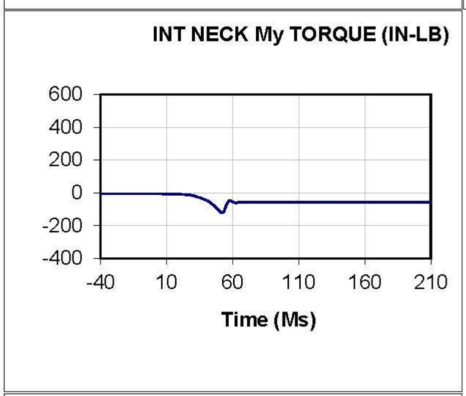
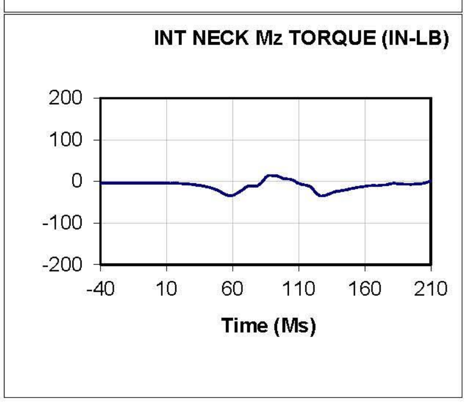
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

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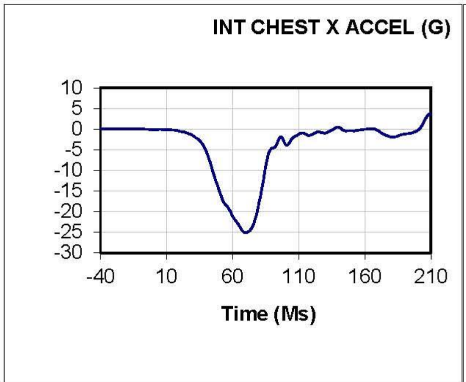
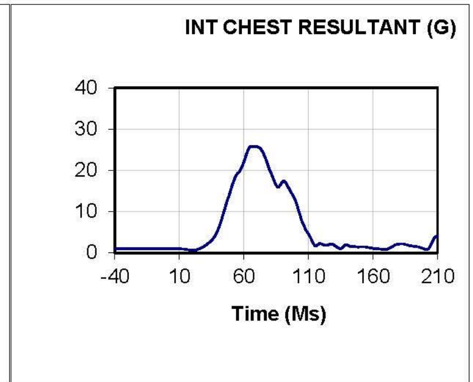
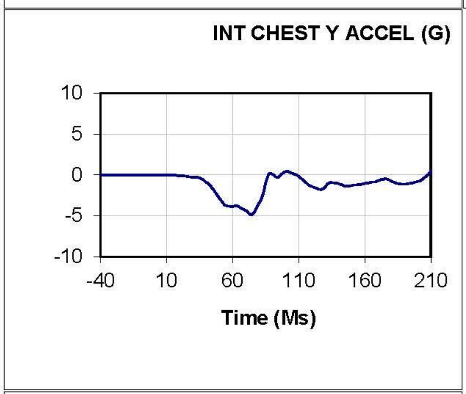
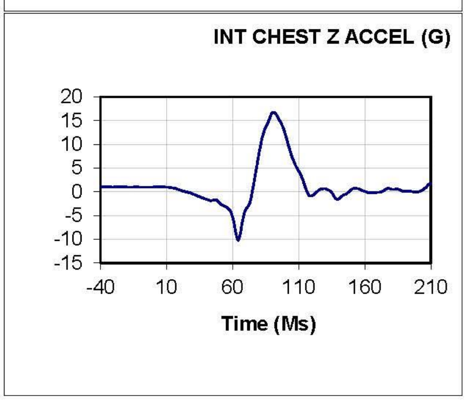
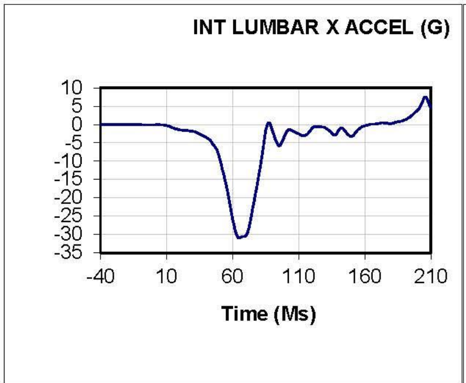
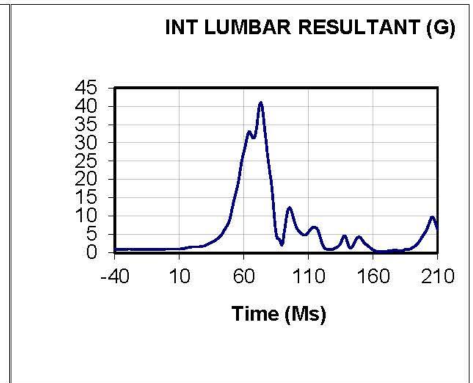

INT CHEST X ACCEL (G)
10
5
0
-5
-10
-15
-20
-25
-30
-40
10
60
110
160
210
Time (Ms)

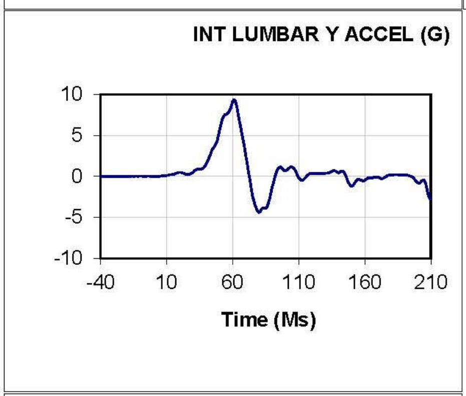

INT CHEST RESULTANT (G)
40
30
20
10
0
-40
10
60
110
160
210
Time (Ms)

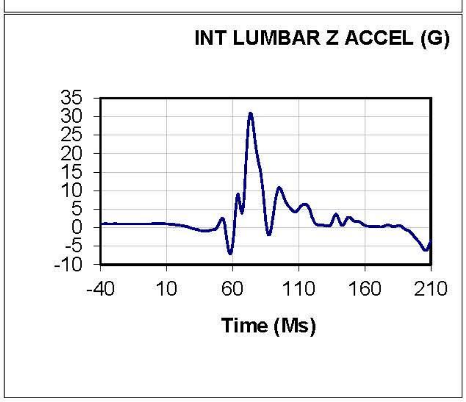

INT CHEST Y ACCEL (G)
10
5
0
-5
-10
-40
10
60
110
160
210
Time (Ms)


INT CHEST Z ACCEL (G)
20
15
10
5
0
-5
-10
-15
-40
10
60
110
160
210
Time (Ms)

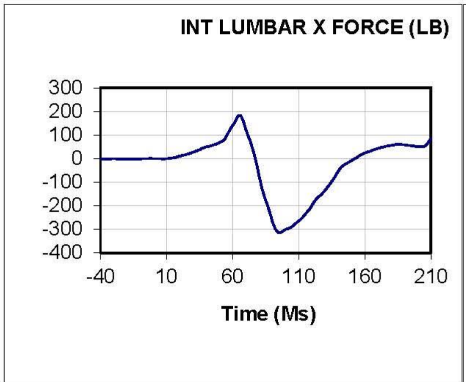

INT LUMBAR X ACCEL (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
10
60
110
160
210
Time (Ms)

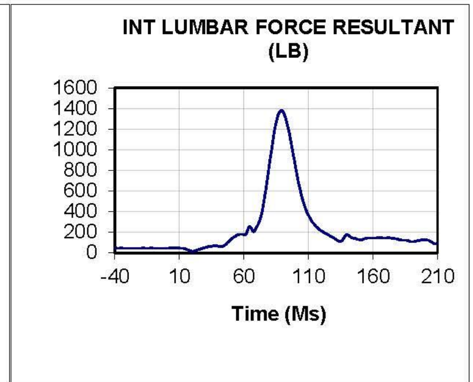

INT LUMBAR RESULTANT (G)
45
40
35
30
25
20
15
10
5
0
-40
10
60
110
160
210
Time (Ms)

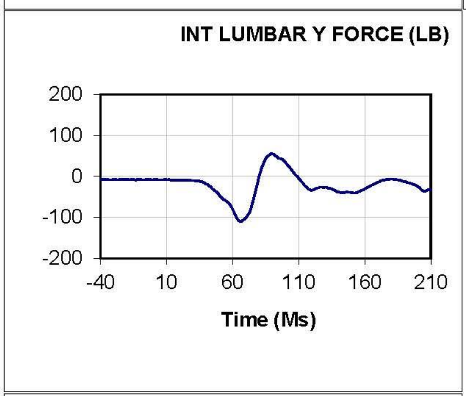

INT LUMBAR Y ACCEL (G)
10
5
0
-5
-10
-40
10
60
110
160
210
Time (Ms)

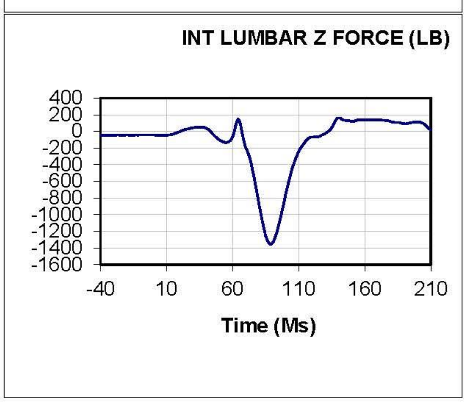

INT LUMBAR Z ACCEL (G)
35
30
25
20
15
10
5
0
-5
-10
-40
10
60
110
160
210
Time (Ms)

201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15



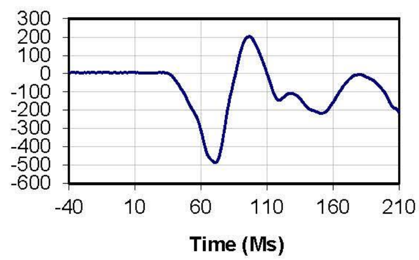



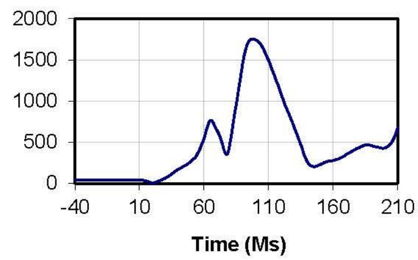



201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

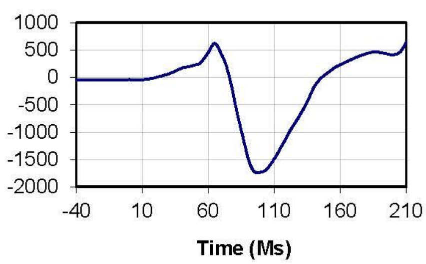
**INT LUMBAR Mx TORQUE (IN-LB)**



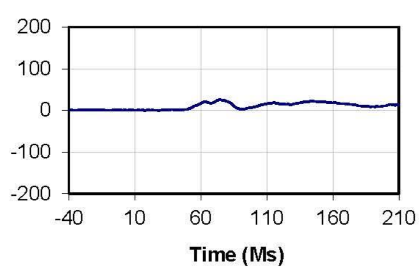

**INT LUMBAR TORQUE RESULTANT (IN-LB)**




**INT LUMBAR My TORQUE (IN-LB)**




**INT LUMBAR Mz TORQUE (IN-LB)**

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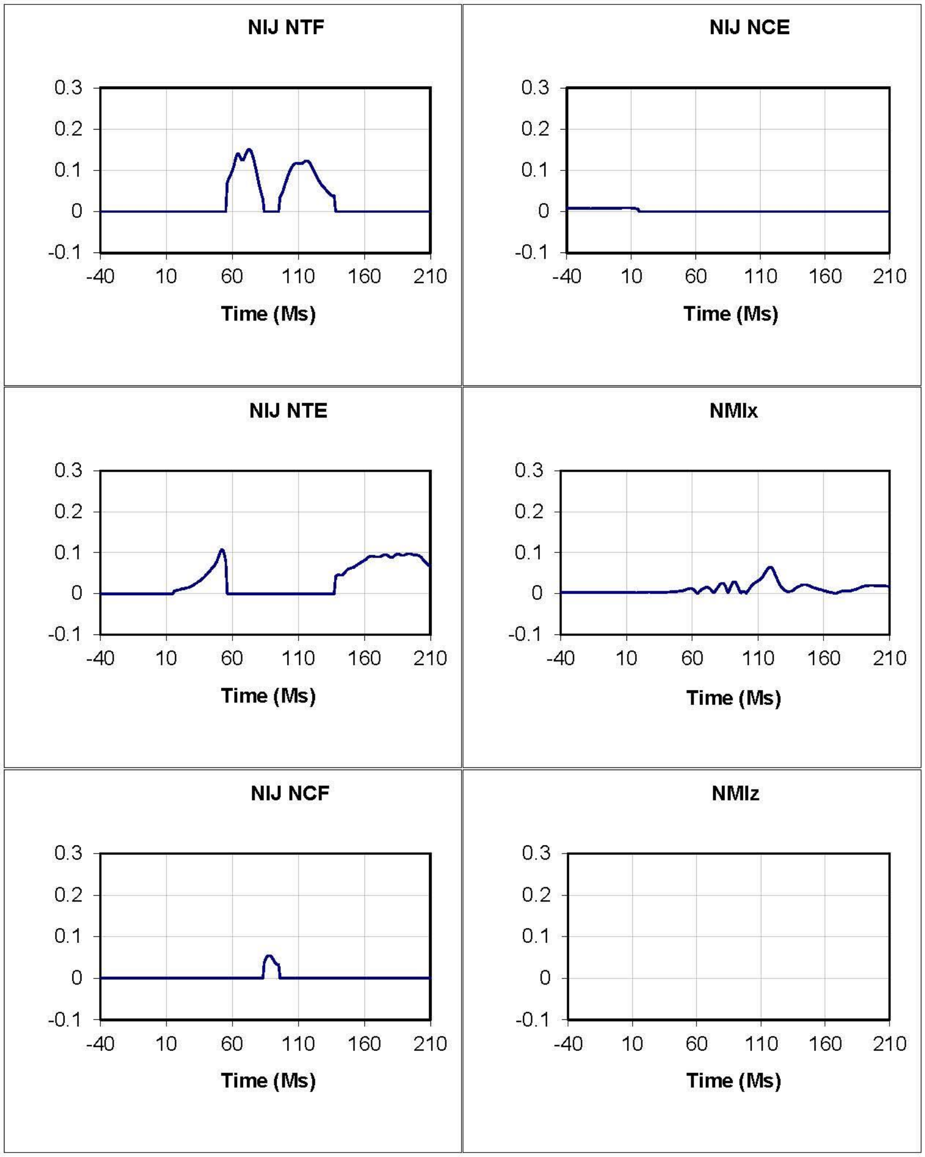
201404 Test: 8792 Test Date: 140602 Subj: LARD Cell: M15

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201404 Test: 8806 Test Date: 140603 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: N15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 7.0 | |
| Impact Rise Time (Ms) | | | | 44.0 | |
| Impact Duration (Ms) | | | | 108.0 | |
| Velocity Change (Ft/Sec) | | 29.89 | | | |
| SLED X ACCEL (G) | 0.04 | 14.74 | -0.67 | 44.0 | 112.0 |
| SLED Y ACCEL (G) | 0.00 | 0.72 | -0.76 | 67.0 | 39.0 |
| SLED Z ACCEL (G) | 1.00 | 3.28 | -1.79 | 33.0 | 37.0 |
| SLED VELOCITY (FT/SEC) | 0.17 | 27.64 | 0.15 | 102.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 29.89 | 0.01 | 108.0 | 0.0 |
| SEAT X ACCEL (G) | -0.04 | 2.58 | -15.79 | 125.0 | 27.0 |
| SEAT Y ACCEL (G) | 0.00 | 1.59 | -1.30 | 131.0 | 18.0 |
| SEAT Z ACCEL (G) | 0.99 | 6.23 | -4.45 | 129.0 | 40.0 |
| SEAT RESULTANT | 0.99 | 16.67 | 0.29 | 52.0 | 109.0 |
| LEFT LAP X FORCE (LB) | -2.21 | -2.02 | -532.71 | 1.0 | 67.0 |
| LEFT LAP Y FORCE (LB) | 3.18 | 332.64 | 3.18 | 64.0 | 1.0 |
| LEFT LAP Z FORCE (LB) | -22.28 | -22.44 | -1957.84 | 1.0 | 64.0 |
| LEFT LAP RESULTANT (LB) | 22.62 | 2052.73 | 22.75 | 64.0 | 1.0 |
| RIGHT LAP X FORCE (LB) | -2.41 | -2.10 | -511.80 | 2.0 | 65.0 |
| RIGHT LAP Y FORCE (LB) | 1.84 | 2.14 | -318.45 | 6.0 | 64.0 |
| RIGHT LAP Z FORCE (LB) | -27.07 | -26.98 | -1977.75 | 0.0 | 58.0 |
| RIGHT LAP RESULTANT (LB) | 27.24 | 2067.37 | 27.17 | 65.0 | 0.0 |
| LEFT SHOULDER X FORCE (LB) | -17.70 | -19.14 | -1171.53 | 4.0 | 68.0 |
| LEFT SHOULDER Y FORCE (LB) | 4.39 | 22.97 | -13.92 | 63.0 | 92.0 |
| LEFT SHOULDER Z FORCE (LB) | 4.12 | 299.15 | 2.98 | 74.0 | 9.0 |
| LEFT SHOULDER RESULTANT (LB) | 18.70 | 1202.26 | 20.11 | 69.0 | 5.0 |
| RIGHT SHOULDER X FORCE (LB) | -21.66 | -22.90 | -992.47 | 3.0 | 67.0 |
| RIGHT SHOULDER Y FORCE (LB) | -4.07 | -2.81 | -239.80 | 13.0 | 75.0 |
| RIGHT SHOULDER Z FORCE (LB) | 3.69 | 43.68 | 3.09 | 71.0 | 14.0 |
| RIGHT SHOULDER RESULTANT (LE | 22.34 | 1014.75 | 23.62 | 67.0 | 3.0 |
| CROTCH STRAP X FORCE (LB) | 1.34 | 3.35 | -7.29 | 121.0 | 32.0 |
| CROTCH STRAP Y FORCE (LB) | -0.76 | 1.28 | -2.08 | 66.0 | 51.0 |
| CROTCH STRAP Z FORCE (LB) | -2.39 | 4.10 | -8.08 | 77.0 | 50.0 |
| CROTCH STRAP FORCE (LB) | 2.86 | 9.08 | 1.10 | 50.0 | 85.0 |
| INT HEAD X ACCEL (G) | -0.03 | -0.05 | -24.42 | 1.0 | 102.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 1.40 | -0.48 | 116.0 | 88.0 |

201404 Test: 8806 Test Date: 140603 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: N15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT HEAD Z ACCEL (G) | 0.98 | 2.27 | -20.21 | 87.0 | 62.0 |
| INT HEAD RESULTANT (G) | 0.98 | 25.08 | 0.38 | 101.0 | 18.0 |
| INT HEAD HIC | | 72.53 | | 90.0 | 120.0 |
| INT HEAD Ry ANG (RAD/SEC2) | 1.27 | 825.04 | -1314.32 | 54.0 | 108.0 |
| | | | | | |
| INT NECK X FORCE (LB) | -1.94 | -0.89 | -336.95 | 3.0 | 111.0 |
| INT NECK Y FORCE (LB) | -3.53 | -1.98 | -37.15 | 33.0 | 108.0 |
| INT NECK Z FORCE (LB) | -7.61 | 241.46 | -63.72 | 62.0 | 84.0 |
| INT NECK RESULTANT (LB) | 8.62 | 380.95 | 4.63 | 109.0 | 15.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 5.52 | 19.50 | -41.98 | 99.0 | 118.0 |
| INT NECK My TORQUE (IN-LB) | -3.43 | 219.37 | -127.67 | 108.0 | 54.0 |
| INT NECK Mz TORQUE (IN-LB) | -8.55 | 5.07 | -21.07 | 89.0 | 55.0 |
| INT NECK TORQUE RES (IN-LB) | 10.76 | 219.65 | 8.64 | 108.0 | 80.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | -0.03 | 0.21 | -24.86 | 137.0 | 64.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 0.81 | -2.28 | 98.0 | 70.0 |
| INT CHEST Z ACCEL (G) | 0.97 | 17.75 | -9.32 | 86.0 | 59.0 |
| INT CHEST RESULTANT (G) | 0.97 | 26.01 | 0.61 | 63.0 | 19.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.03 | -0.03 | -31.50 | 3.0 | 60.0 |
| INT LUMBAR Y ACCEL (G) | 0.01 | 4.80 | -1.48 | 56.0 | 76.0 |
| INT LUMBAR Z ACCEL (G) | 1.01 | 31.50 | -1.46 | 71.0 | 113.0 |
| INT LUMBAR RESULTANT (G) | 1.01 | 36.94 | 0.56 | 70.0 | 129.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | -4.41 | 242.21 | -325.35 | 60.0 | 88.0 |
| INT LUMBAR Y FORCE (LB) | -5.27 | 37.38 | -40.95 | 95.0 | 61.0 |
| INT LUMBAR Z FORCE (LB) | -17.14 | 215.23 | -1051.33 | 110.0 | 84.0 |
| INT LUMBAR FORCE RESULTANT ( | 18.48 | 1092.72 | 7.44 | 84.0 | 16.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 45.86 | 329.42 | -140.79 | 94.0 | 62.0 |
| INT LUMBAR My TORQUE (IN-LB) | 7.43 | 944.68 | -1597.21 | 61.0 | 89.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | 1.05 | 20.77 | -2.20 | 78.0 | 49.0 |
| INT LUMBAR TORQUE RESULTANT | 46.48 | 1623.77 | 35.91 | 90.0 | 73.0 |

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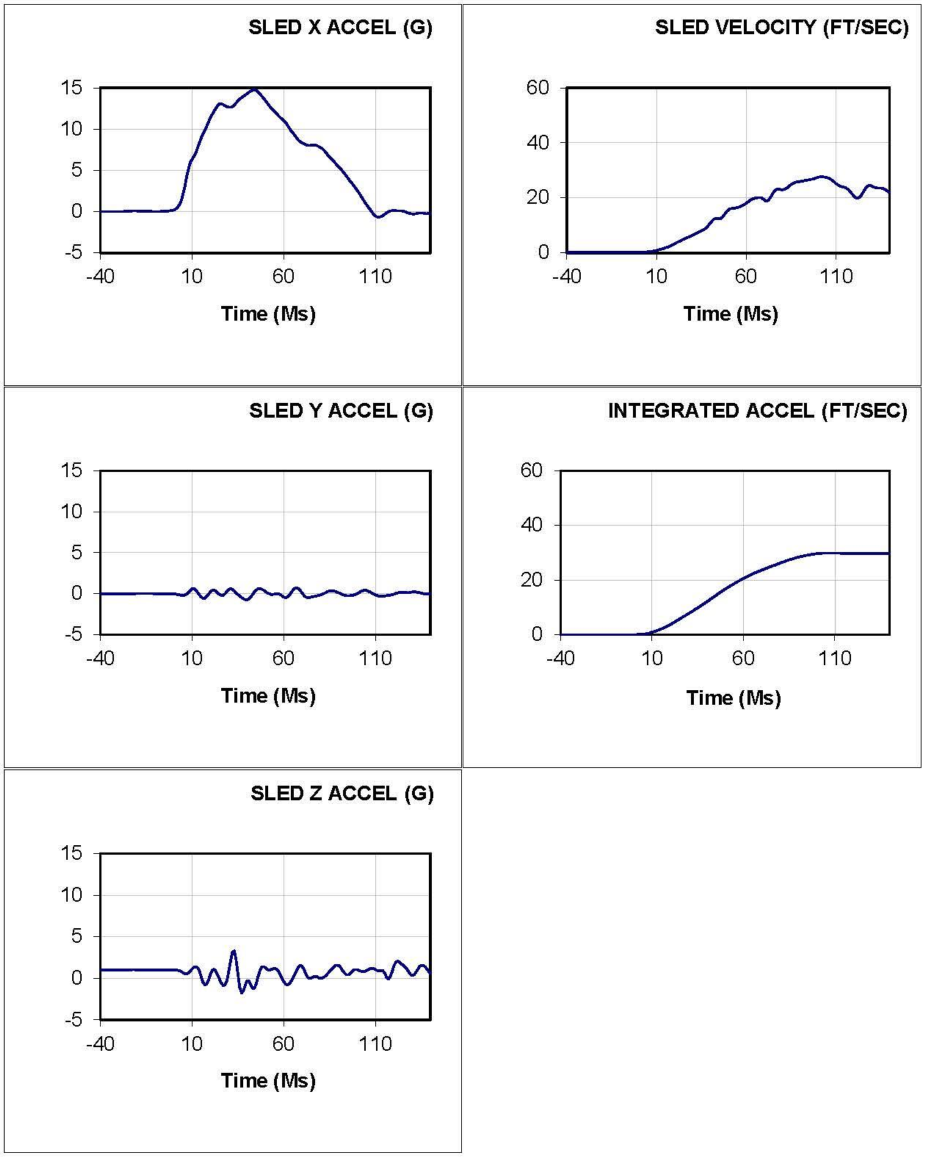
201404 Test: 8806 Test Date: 140603 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: N15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 0.00 | -336.95 | 0.0 | 111.0 |
| NIJ TENSION (LB) | | 241.46 | | 62.0 | |
| NIJ COMPRESSION (LB) | | -63.72 | | 84.0 | |
| NIJ FLEXION (IN-LB) | | 454.95 | | 108.0 | |
| NIJ EXTENSION (IN-LB) | | 72.16 | | 52.0 | |
| NIJ NTF | 0.0000 | 0.2178 | 0.0000 | 108.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.1466 | 0.0000 | 57.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.1038 | 0.0000 | 86.0 | 0.0 |
| NIJ NCE | 0.0059 | 0.0074 | 0.0000 | 12.0 | 17.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.14 | | | |
| NIJ NTF AIS >= 3 | | 0.06 | | | |
| NIJ NTF AIS >= 4 | | 0.08 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.13 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.07 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.13 | | | |
| NIJ NCF AIS >= 3 | | 0.05 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.11 | | | |
| NIJ NCE AIS >= 3 | | 0.04 | | | |
| NIJ NCE AIS >= 4 | | 0.06 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0035 | 0.0265 | 0.0001 | 118.0 | 95.0 |
| NMIz | 0.0000 | 0.0000 | 0.0000 | 0.0 | 0.0 |

201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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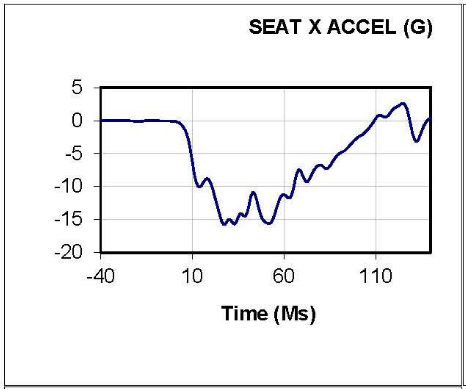
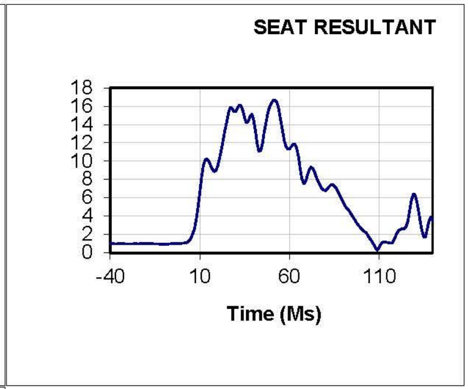
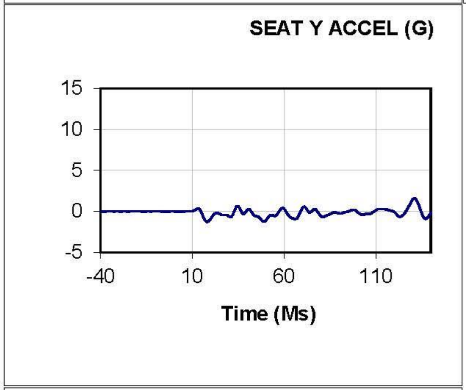
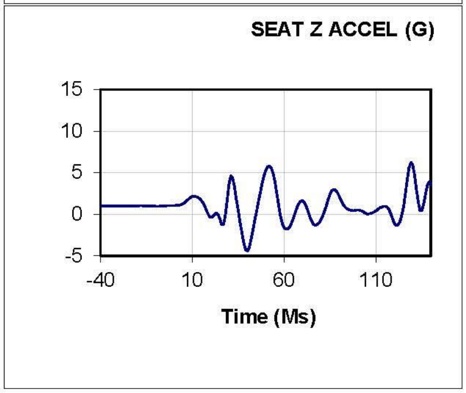
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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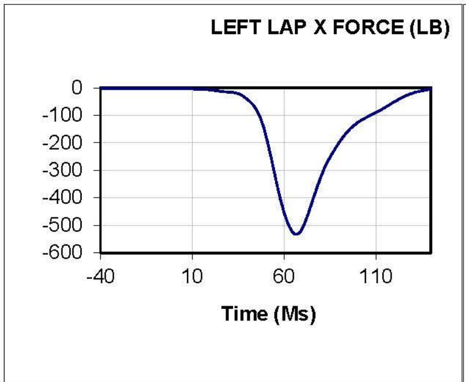
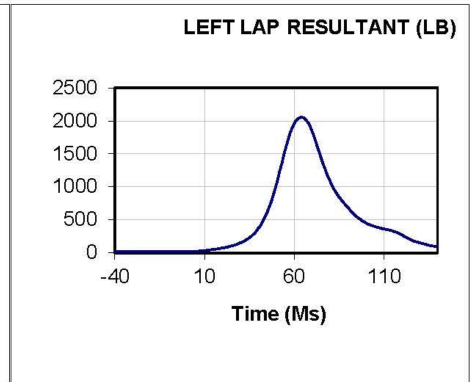
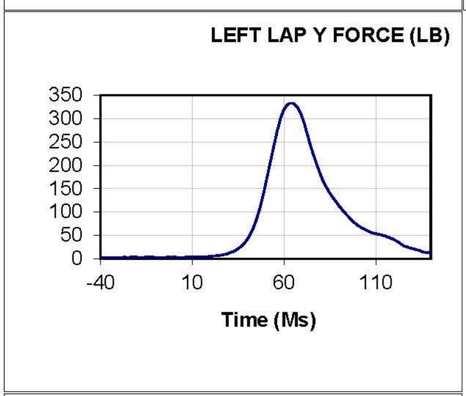
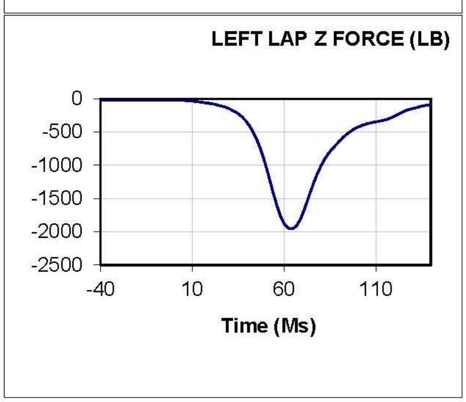
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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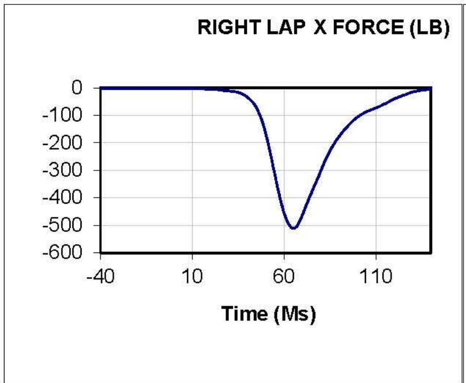
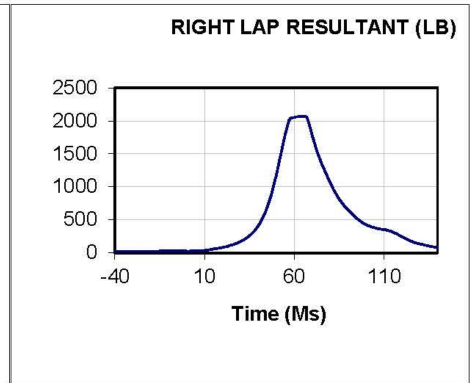
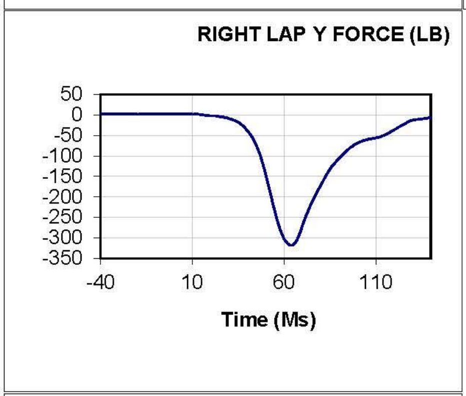
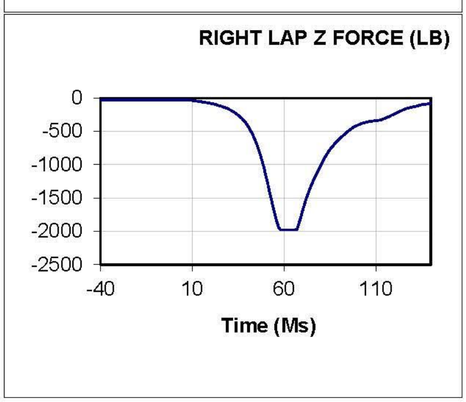
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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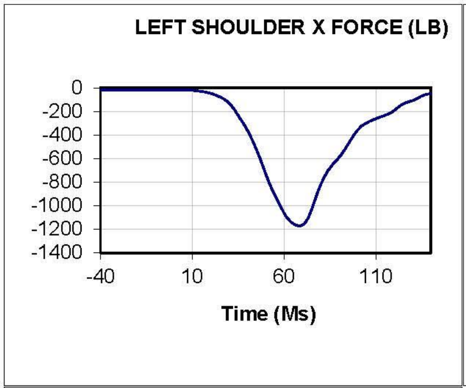
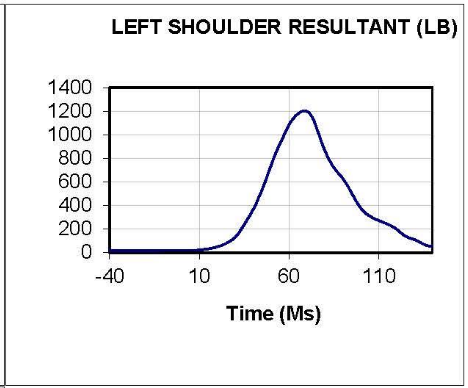
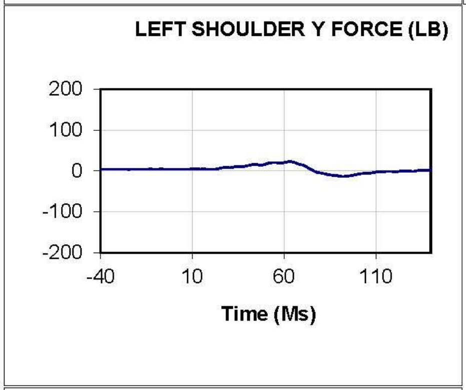
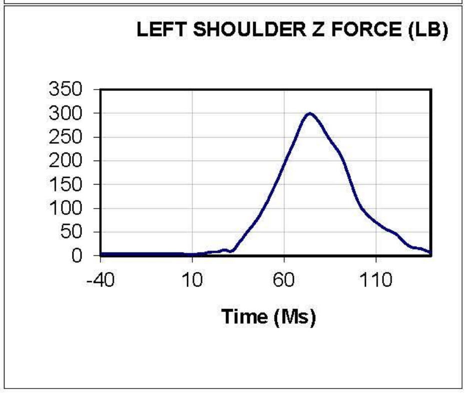
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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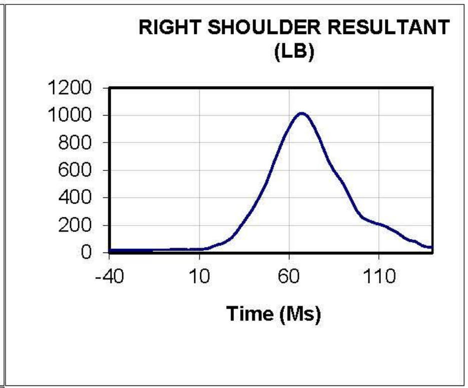
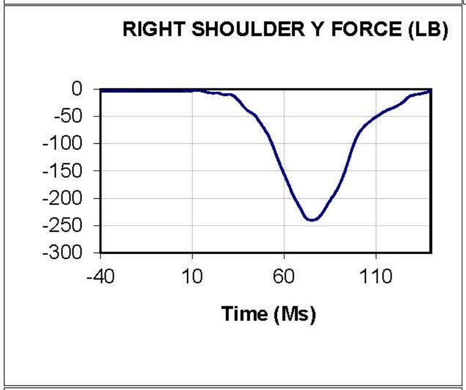
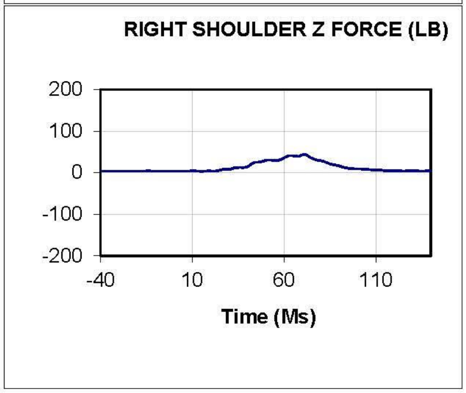
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15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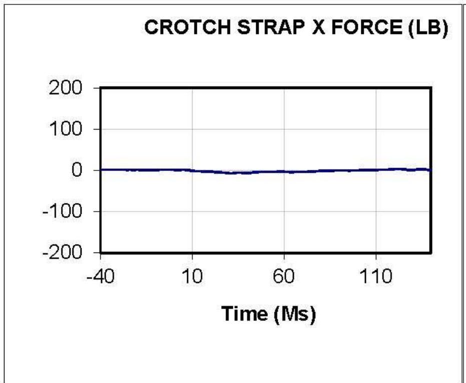
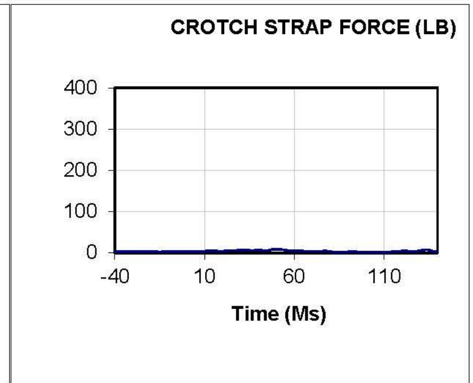
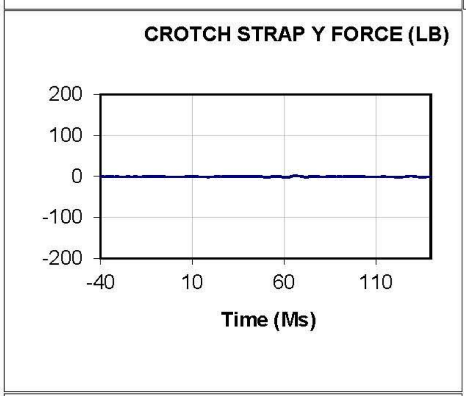
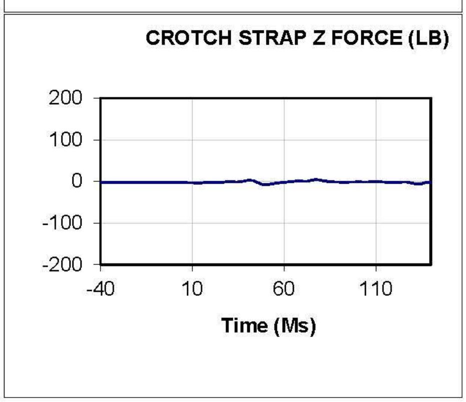
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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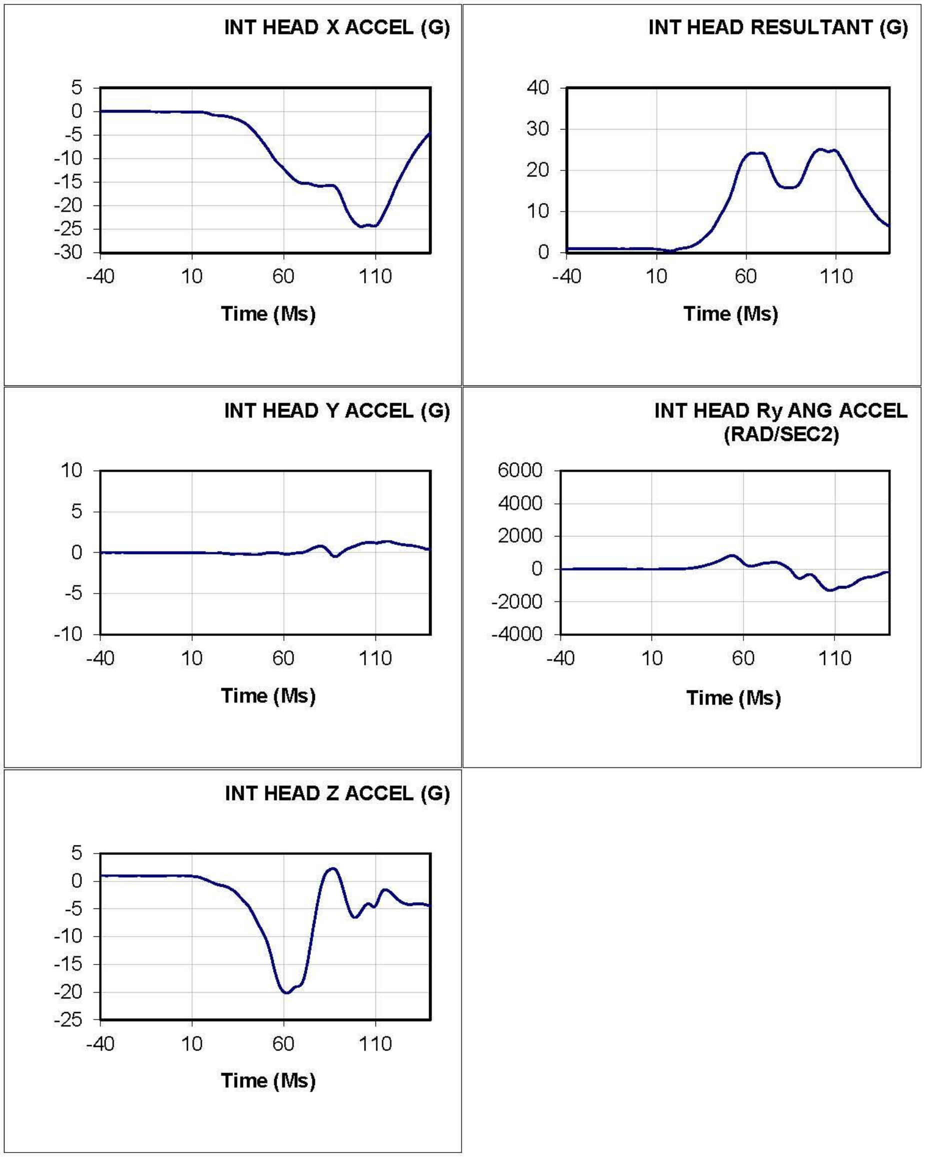
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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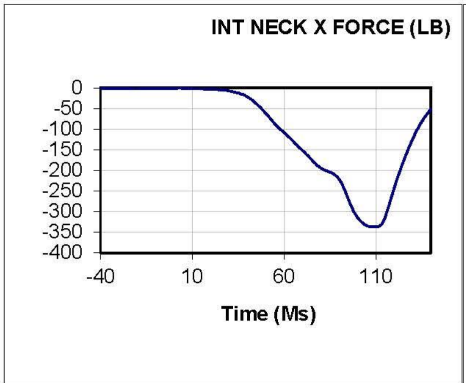
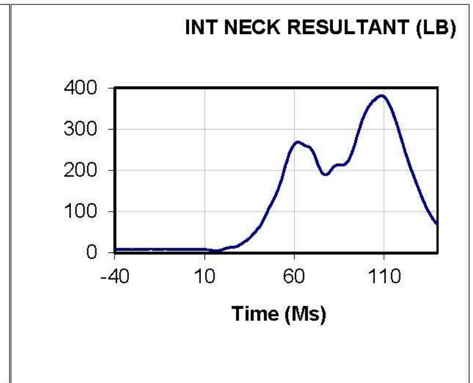
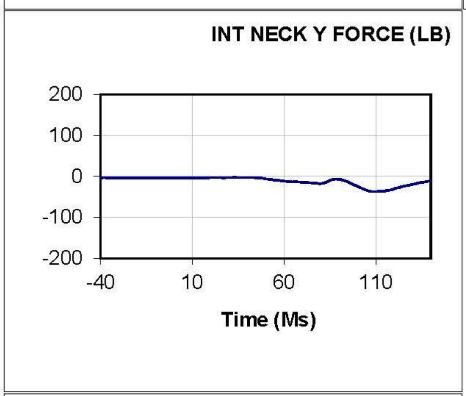
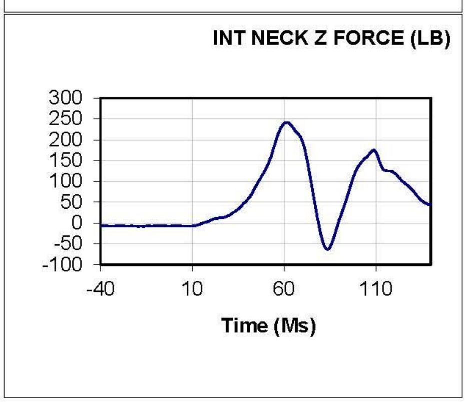
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

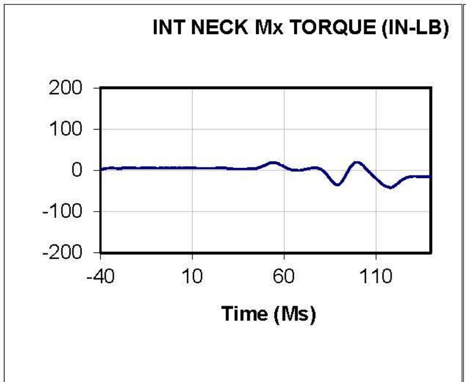


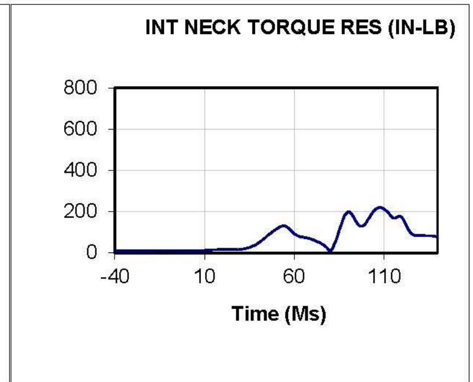



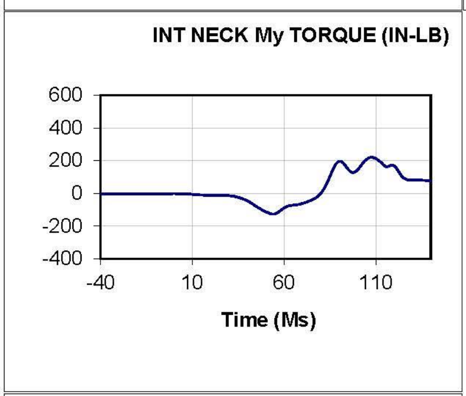



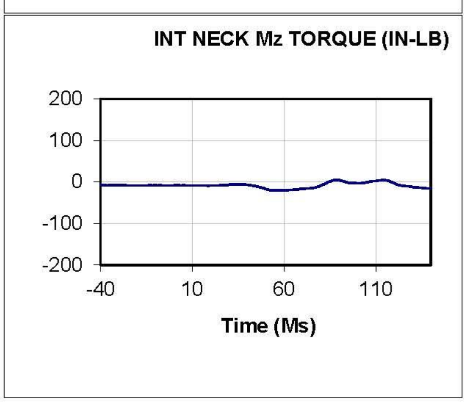



201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

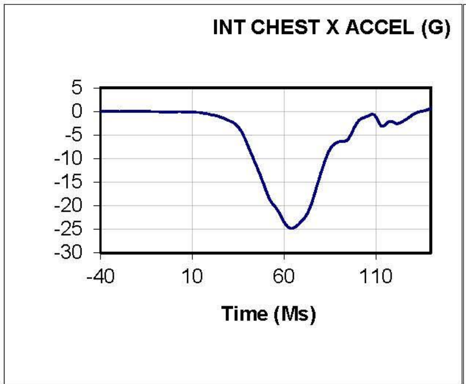


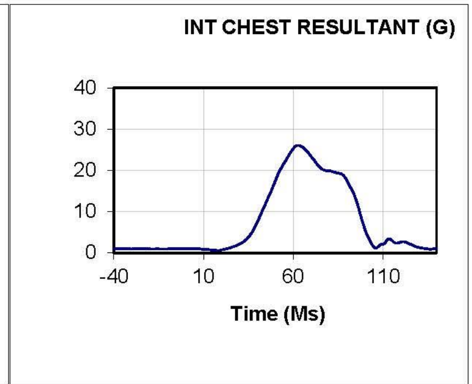



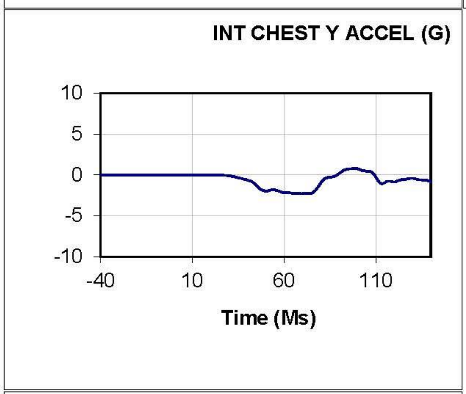



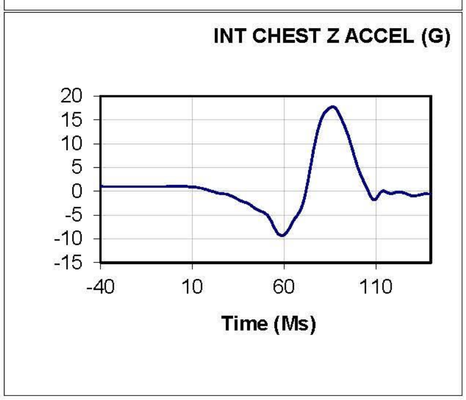



201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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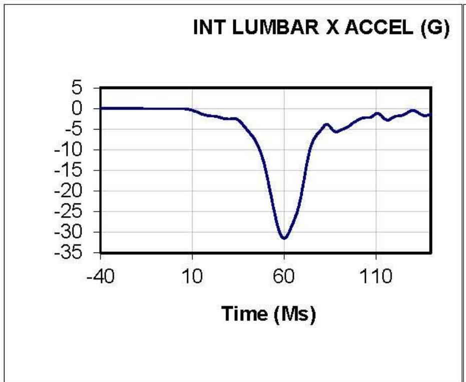
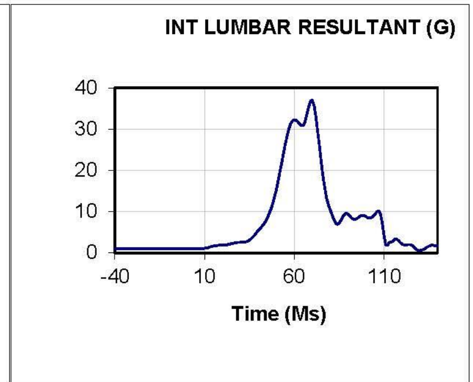
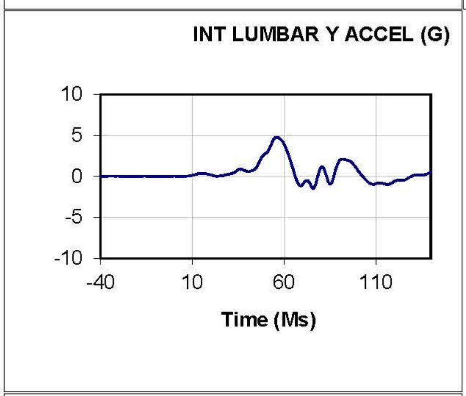
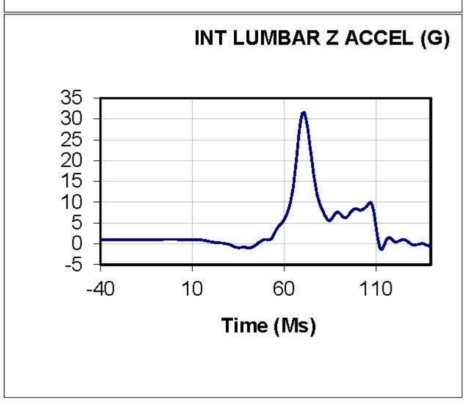
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

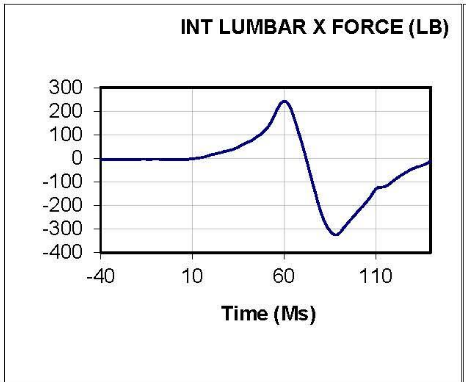


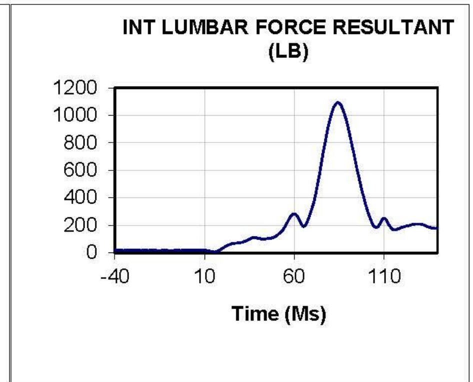



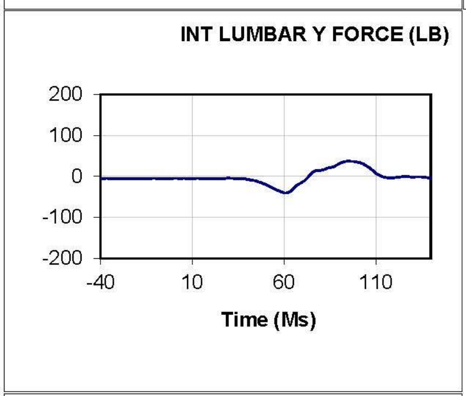



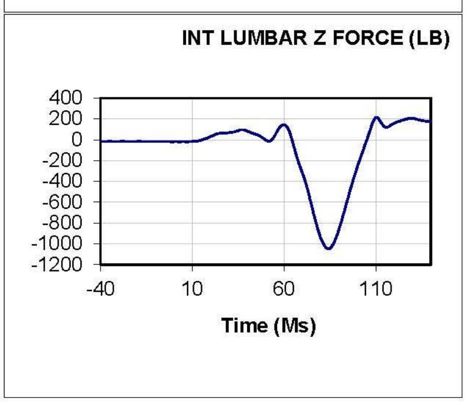



201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

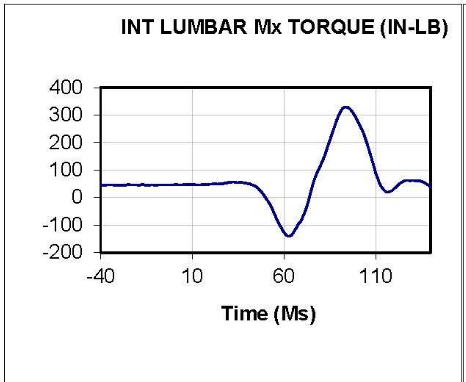


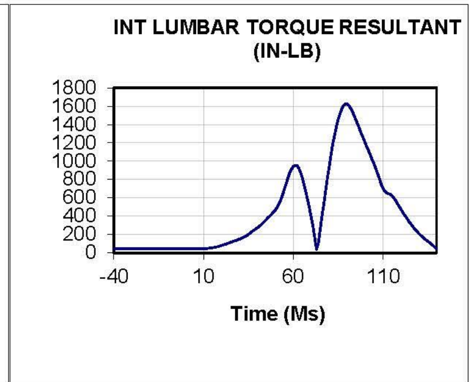



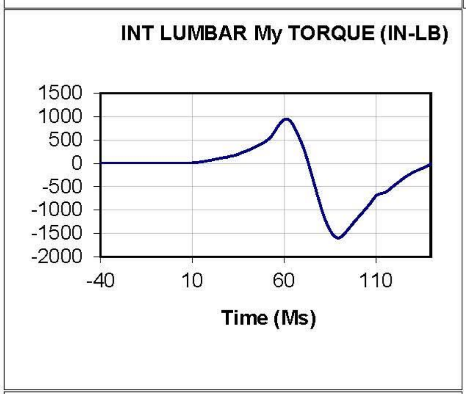



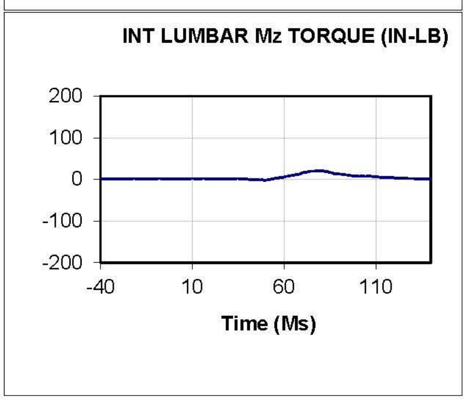



201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15

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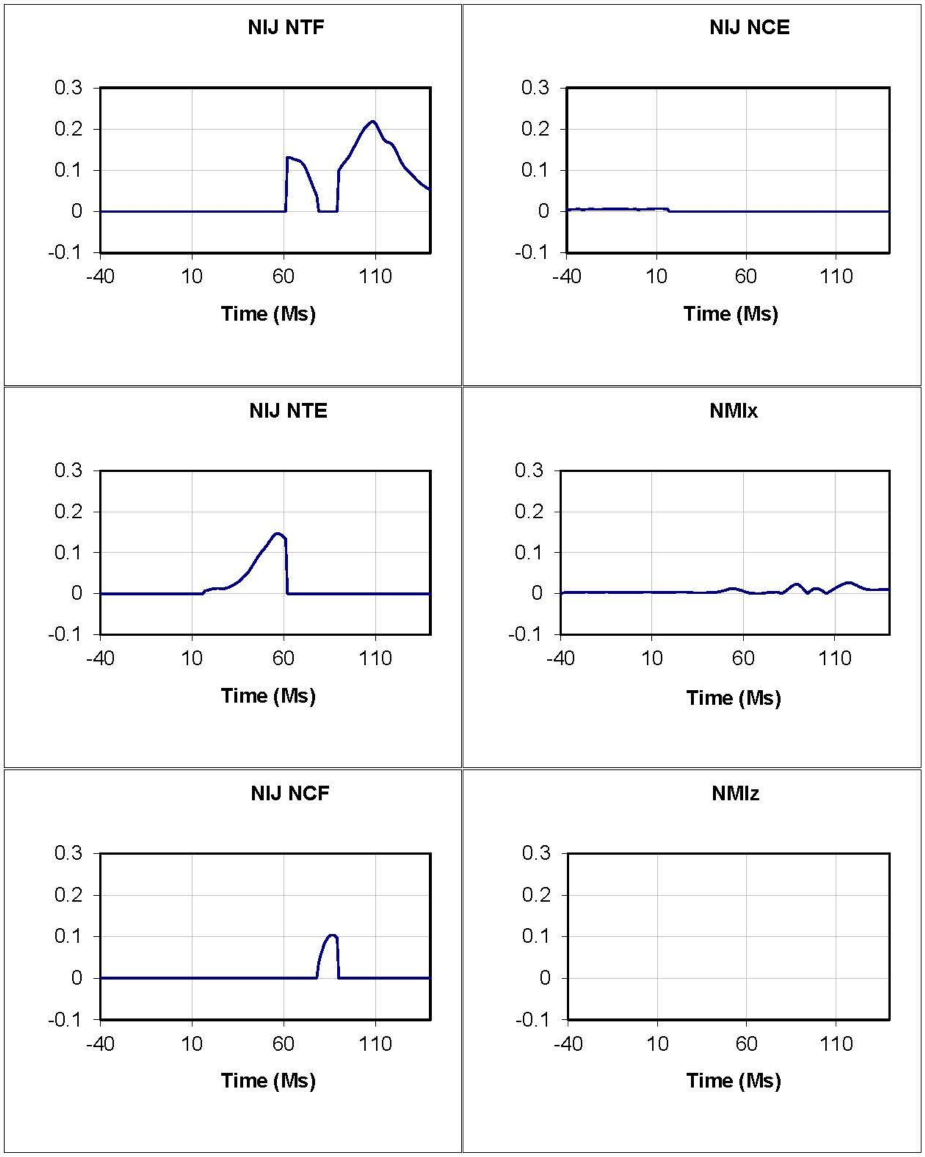
201404 Test: 8806 Test Date: 140603 Subj: LARD Cell: N15



201404 Test: 9103 Test Date: 150528 Subj: LARD Wt: 250.0
Nom G: 15.0 Cell: O15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 7.0 | |
| Impact Rise Time (Ms) | | | | 45.0 | |
| Impact Duration (Ms) | | | | 105.0 | |
| Velocity Change (Ft/Sec) | | 30.17 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.02 | 15.10 | -1.18 | 45.0 | 111.0 |
| SLED Y ACCEL (G) | 0.00 | 1.86 | -1.28 | 58.0 | 85.0 |
| SLED Z ACCEL (G) | 0.00 | 2.83 | -2.93 | 33.0 | 28.0 |
| SLED RESULTANT (G) | 0.02 | 15.14 | 0.11 | 45.0 | 176.0 |
| SLED VELOCITY (FT/SEC) | 0.19 | 29.88 | 0.21 | 152.0 | 1.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.17 | 0.02 | 104.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.02 | 3.55 | -17.11 | 128.0 | 29.0 |
| SEAT Y ACCEL (G) | 0.00 | 1.66 | -2.99 | 59.0 | 84.0 |
| SEAT Z ACCEL (G) | 0.00 | 5.19 | -5.84 | 52.0 | 41.0 |
| SEAT RESULTANT | 0.03 | 17.64 | 0.13 | 39.0 | 0.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -23.15 | -1.16 | -2005.21 | 177.0 | 60.0 |
| LEFT LAP Y FORCE (LB) | -2.83 | 257.29 | -4.38 | 64.0 | 17.0 |
| LEFT LAP Z FORCE (LB) | -1.41 | 591.95 | -1.72 | 66.0 | 156.0 |
| LEFT LAP RESULTANT (LB) | 23.36 | 2106.40 | 2.05 | 65.0 | 177.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -18.18 | -0.48 | -1970.09 | 177.0 | 56.0 |
| RIGHT LAP Y FORCE (LB) | -1.10 | 814.51 | -1.68 | 66.0 | 159.0 |
| RIGHT LAP Z FORCE (LB) | 2.81 | 290.52 | 1.76 | 63.0 | 169.0 |
| RIGHT LAP RESULTANT (LB) | 18.44 | 2150.84 | 2.52 | 66.0 | 169.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -20.87 | -11.50 | -1088.13 | 177.0 | 68.0 |
| LEFT SHOULDER Y FORCE (LB) | -1.53 | 9.64 | -13.83 | 58.0 | 85.0 |
| LEFT SHOULDER Z FORCE (LB) | -0.16 | 255.10 | -2.47 | 75.0 | 16.0 |
| LEFT SHOULDER RESULTANT (LB) | 20.93 | 1112.21 | 11.90 | 69.0 | 177.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -16.27 | -8.34 | -1262.92 | 163.0 | 74.0 |
| RIGHT SHOULDER Y FORCE (LB) | -1.19 | 26.75 | -13.80 | 50.0 | 95.0 |
| RIGHT SHOULDER Z FORCE (LB) | 0.19 | 308.15 | -1.98 | 81.0 | 15.0 |
| RIGHT SHOULDER RESULTANT (LB) | 16.32 | 1292.63 | 8.37 | 74.0 | 163.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | -0.01 | 0.00 | -23.32 | 4.0 | 98.0 |
| INT HEAD Y ACCEL (G) | -0.01 | 1.66 | -5.31 | 136.0 | 93.0 |
| INT HEAD Z ACCEL (G) | 0.00 | 0.00 | -18.39 | 0.0 | 74.0 |
| INT HEAD RESULTANT (G) | 0.03 | 24.09 | 0.01 | 97.0 | 0.0 |
| INT HEAD HIC | | 75.37 | | 72.0 | 102.0 |
| INT HEAD Ry ANG (RAD/SEC2) | -1.02 | 947.10 | -2029.46 | 79.0 | 97.0 |

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201404 Test: 9103 Test Date: 150528 Subj: LARD Wt: 250.0
Nom G: 15.0 Cell: O15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | 1.42 | 5.06 | -428.08 | 177.0 | 103.0 |
| INT NECK Y FORCE (LB) | -2.13 | 56.21 | -42.93 | 87.0 | 133.0 |
| INT NECK Z FORCE (LB) | -3.47 | 255.29 | -4.09 | 114.0 | 1.0 |
| INT NECK RESULTANT (LB) | 4.34 | 479.43 | 2.38 | 104.0 | 14.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 1.80 | 124.34 | -196.96 | 129.0 | 100.0 |
| INT NECK My TORQUE (IN-LB) | 0.45 | 390.71 | -179.59 | 99.0 | 71.0 |
| INT NECK Mz TORQUE (IN-LB) | -3.01 | 66.70 | -23.11 | 161.0 | 83.0 |
| INT NECK TORQUE RES (IN-LB) | 3.69 | 439.28 | 2.98 | 99.0 | 14.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | 0.00 | 3.49 | -27.94 | 113.0 | 66.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 4.81 | -1.95 | 73.0 | 115.0 |
| INT CHEST Z ACCEL (G) | -0.02 | 20.17 | -7.25 | 89.0 | 60.0 |
| INT CHEST RESULTANT (G) | 0.03 | 28.41 | 0.04 | 65.0 | 2.0 |
| | | | | | |
| INT CHEST Ry ANG ACCEL (RAD/SEC2) | 0.01 | 339.80 | -454.27 | 62.0 | 78.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.02 | 4.35 | -31.44 | 177.0 | 62.0 |
| INT LUMBAR Y ACCEL (G) | -0.01 | 5.64 | -1.15 | 72.0 | 98.0 |
| INT LUMBAR Z ACCEL (G) | -0.01 | 26.40 | -7.43 | 72.0 | 118.0 |
| INT LUMBAR RESULTANT (G) | 0.04 | 33.83 | 0.07 | 71.0 | 3.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | -3.34 | 363.43 | -325.48 | 62.0 | 89.0 |
| INT LUMBAR Y FORCE (LB) | -8.91 | 13.61 | -64.49 | 132.0 | 102.0 |
| INT LUMBAR Z FORCE (LB) | -2.86 | 404.98 | -1343.30 | 114.0 | 87.0 |
| INT LUMBAR FORCE RESULTANT (LB) | 9.97 | 1379.89 | 8.57 | 87.0 | 11.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 1.59 | 133.74 | -423.51 | 131.0 | 99.0 |
| INT LUMBAR My TORQUE (IN-LB) | -7.29 | 1671.60 | -693.52 | 62.0 | 89.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | 12.52 | 90.55 | 11.72 | 113.0 | 1.0 |
| INT LUMBAR TORQUE RESULTANT (IN-LB) | 14.61 | 1673.94 | 13.18 | 62.0 | 9.0 |

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201404 Test: 9103 Test Date: 150528 Subj: LARD Wt: 250.0
Nom G: 15.0 Cell: O15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 10.04 | -428.08 | 186.0 | 103.0 |
| NIJ TENSION (LB) | | 255.29 | | 114.0 | |
| NIJ COMPRESSION (LB) | | -4.86 | | -5.0 | |
| NIJ FLEXION (IN-LB) | | 670.26 | | 100.0 | |
| NIJ EXTENSION (IN-LB) | | 86.88 | | 55.0 | |
| NIJ NTF | 0.0000 | 0.2949 | 0.0000 | 114.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.1799 | 0.0000 | 70.0 | 0.0 |
| NIJ NCF | 0.0008 | 0.0000 | 0.0000 | 0.0 | 0.0 |
| NIJ NCE | 0.0018 | 0.0038 | 0.0000 | 7.0 | 14.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.15 | | | |
| NIJ NTF AIS >= 3 | | 0.07 | | | |
| NIJ NTF AIS >= 4 | | 0.09 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.14 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.08 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.11 | | | |
| NIJ NCF AIS >= 3 | | 0.04 | | | |
| NIJ NCF AIS >= 4 | | 0.06 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.11 | | | |
| NIJ NCE AIS >= 3 | | 0.04 | | | |
| NIJ NCE AIS >= 4 | | 0.06 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0011 | 0.1243 | 0.0007 | 100.0 | 14.0 |
| NMIz | 0.0019 | 0.0421 | 0.0010 | 161.0 | 91.0 |

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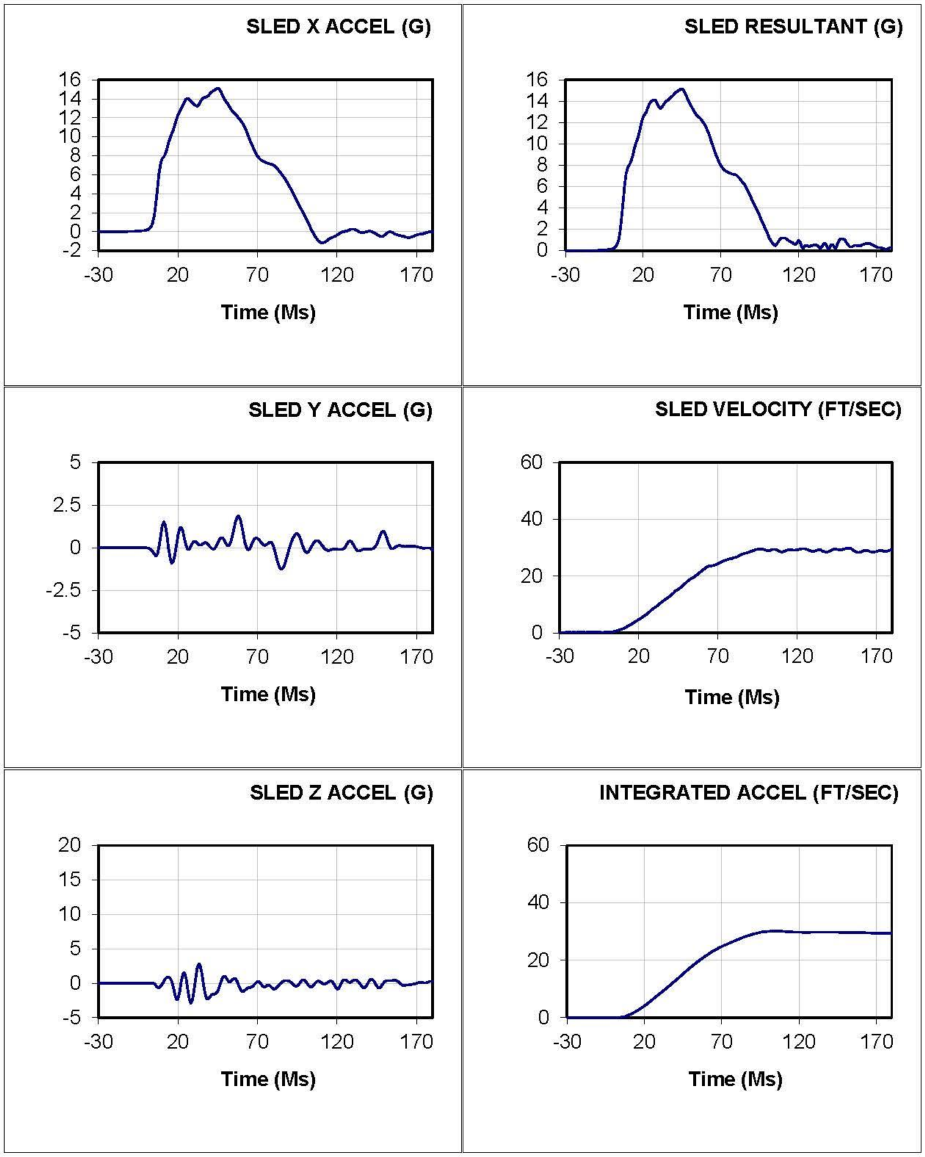
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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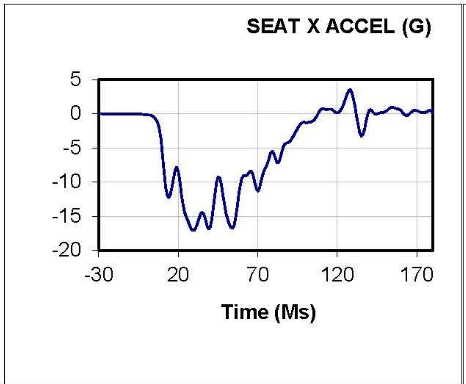
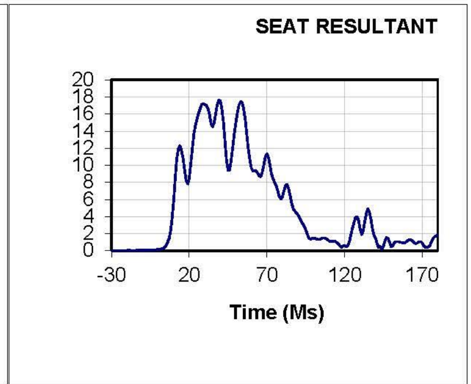
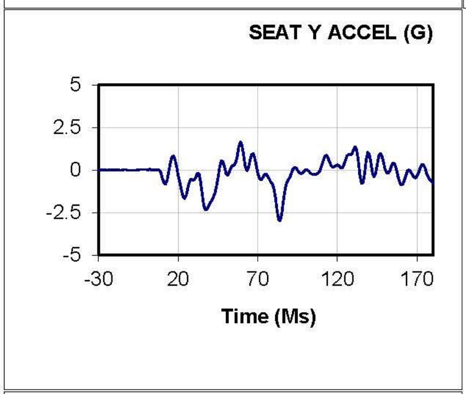
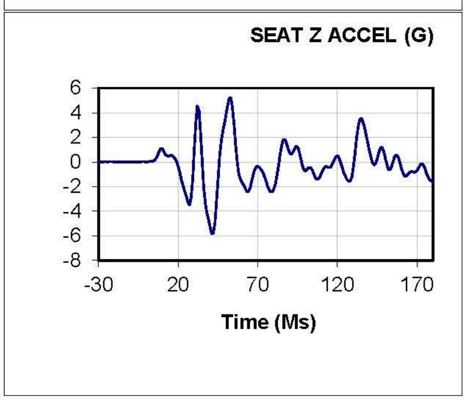
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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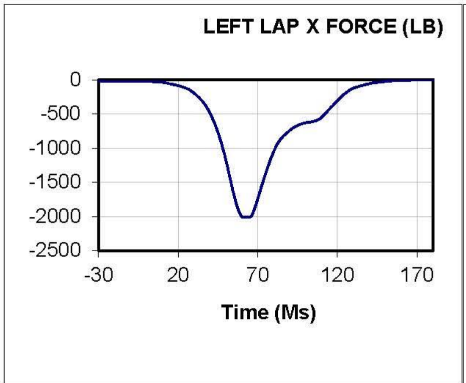
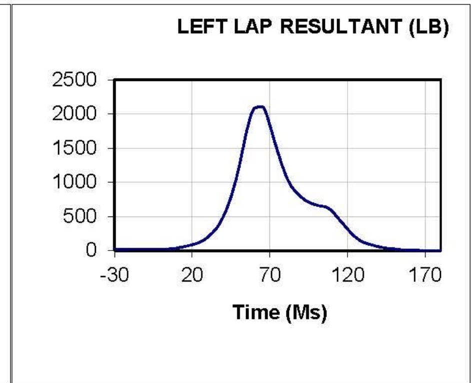
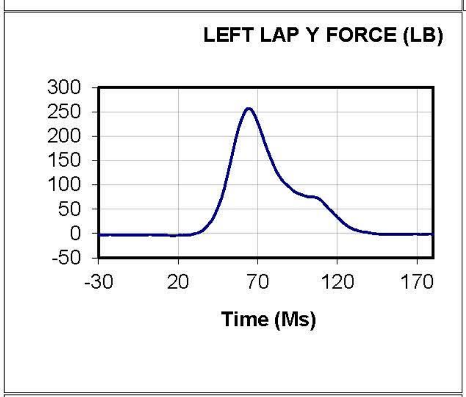
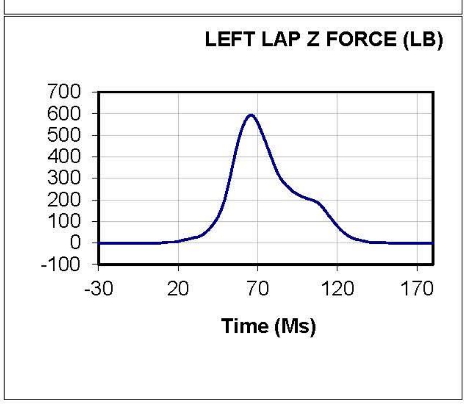
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

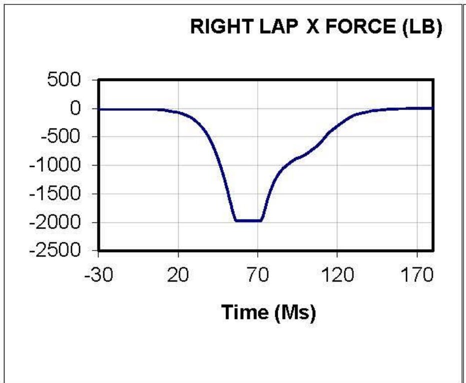


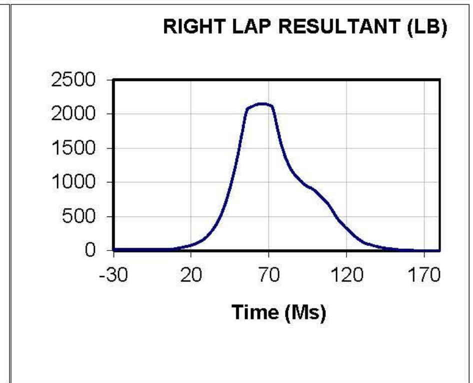



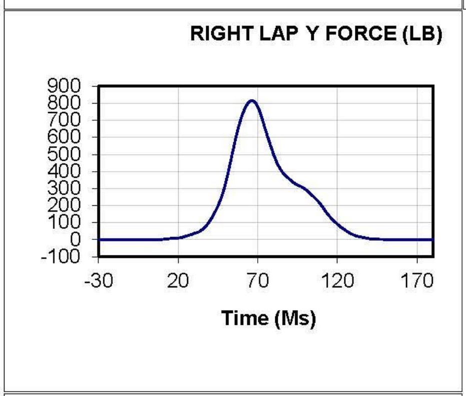



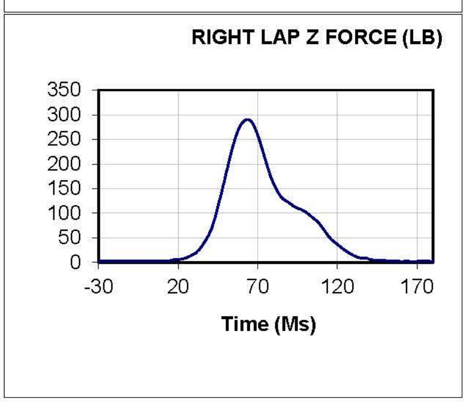



201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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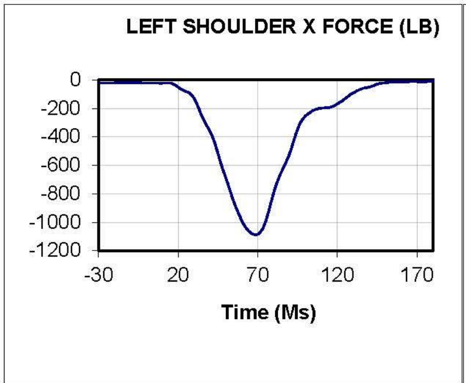
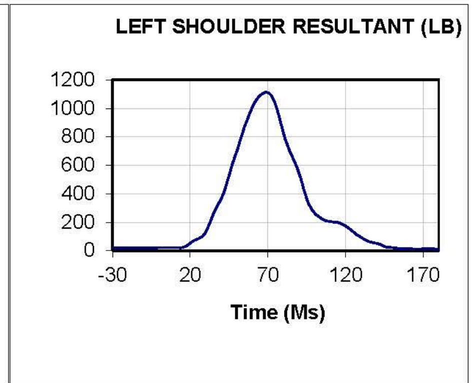
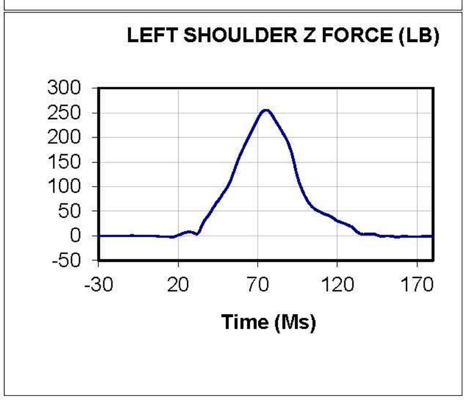
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15





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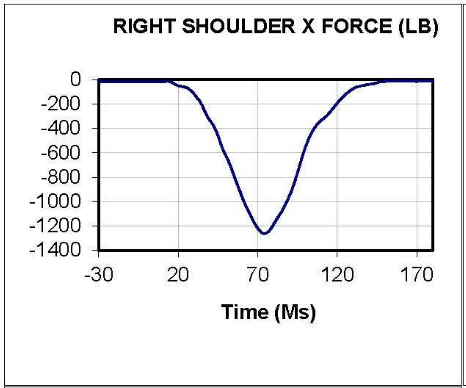
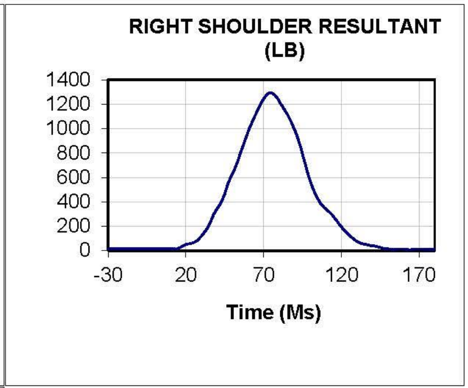
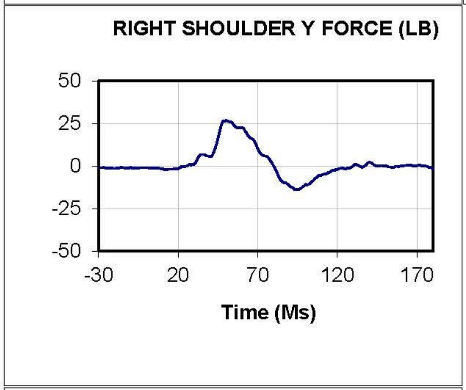
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15





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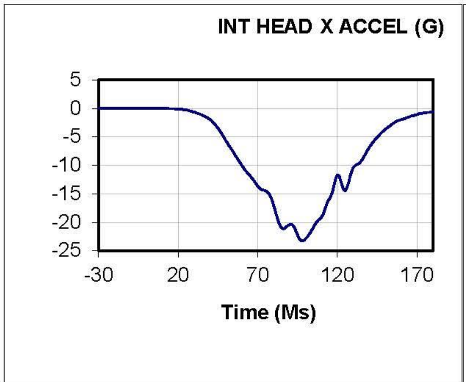
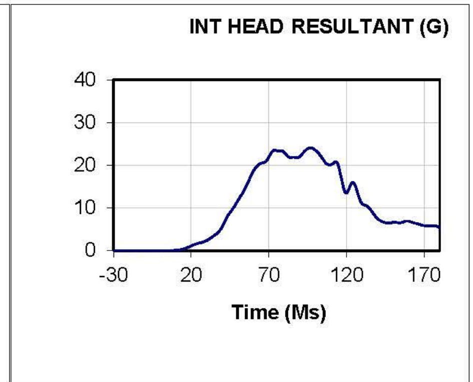
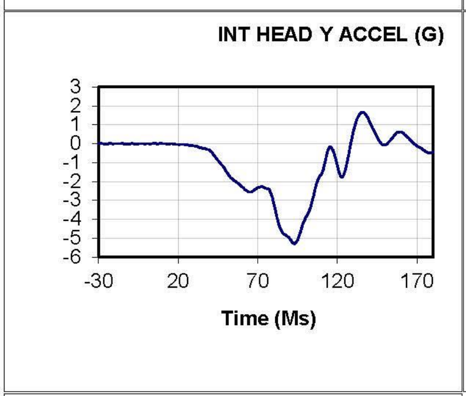
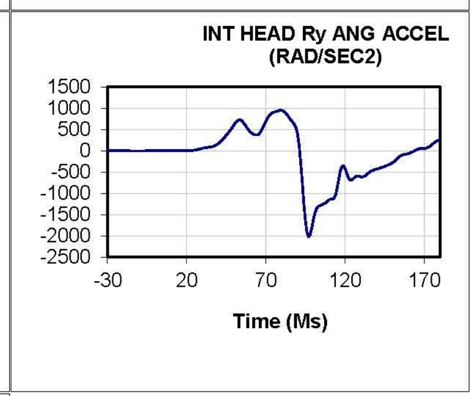
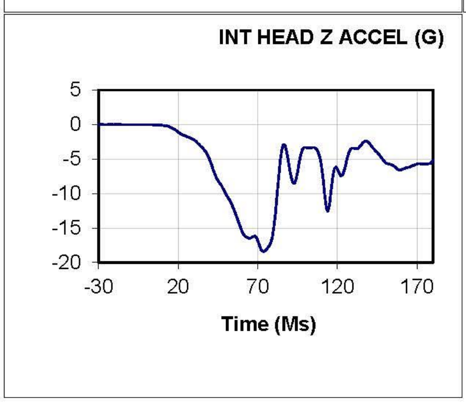
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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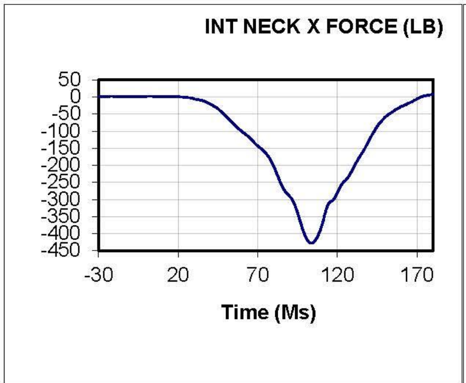
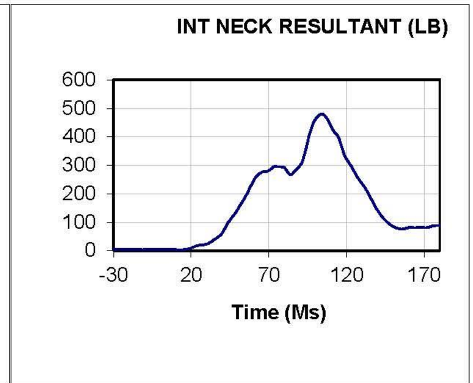
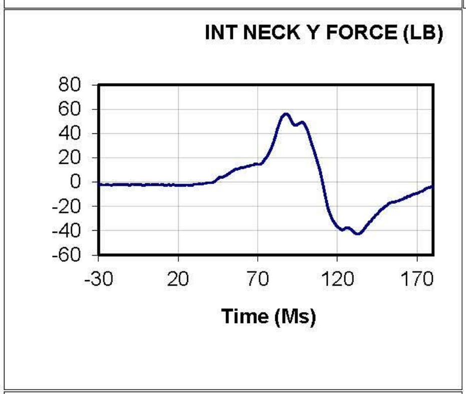
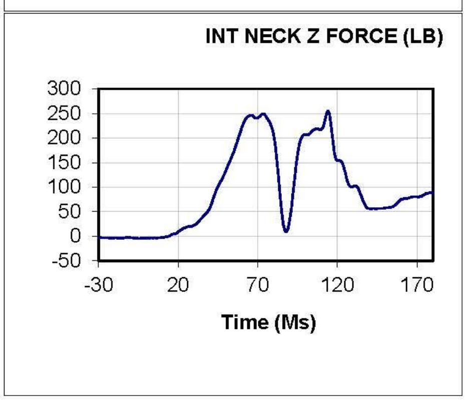
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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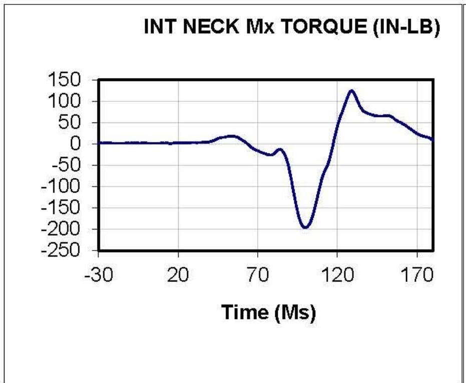
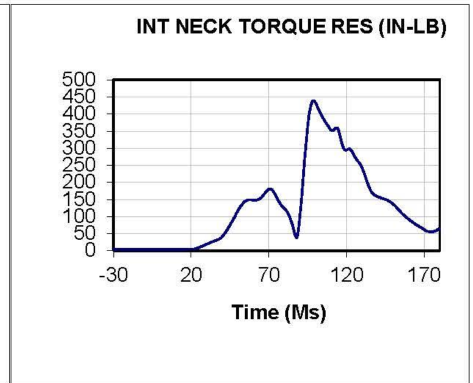
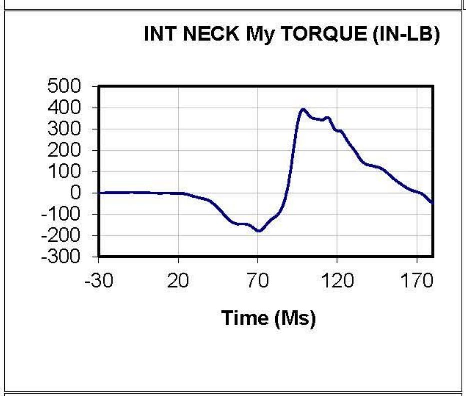
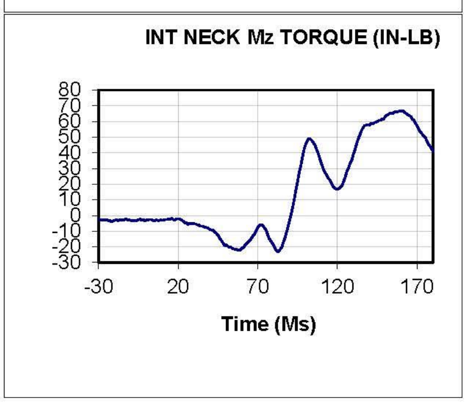
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

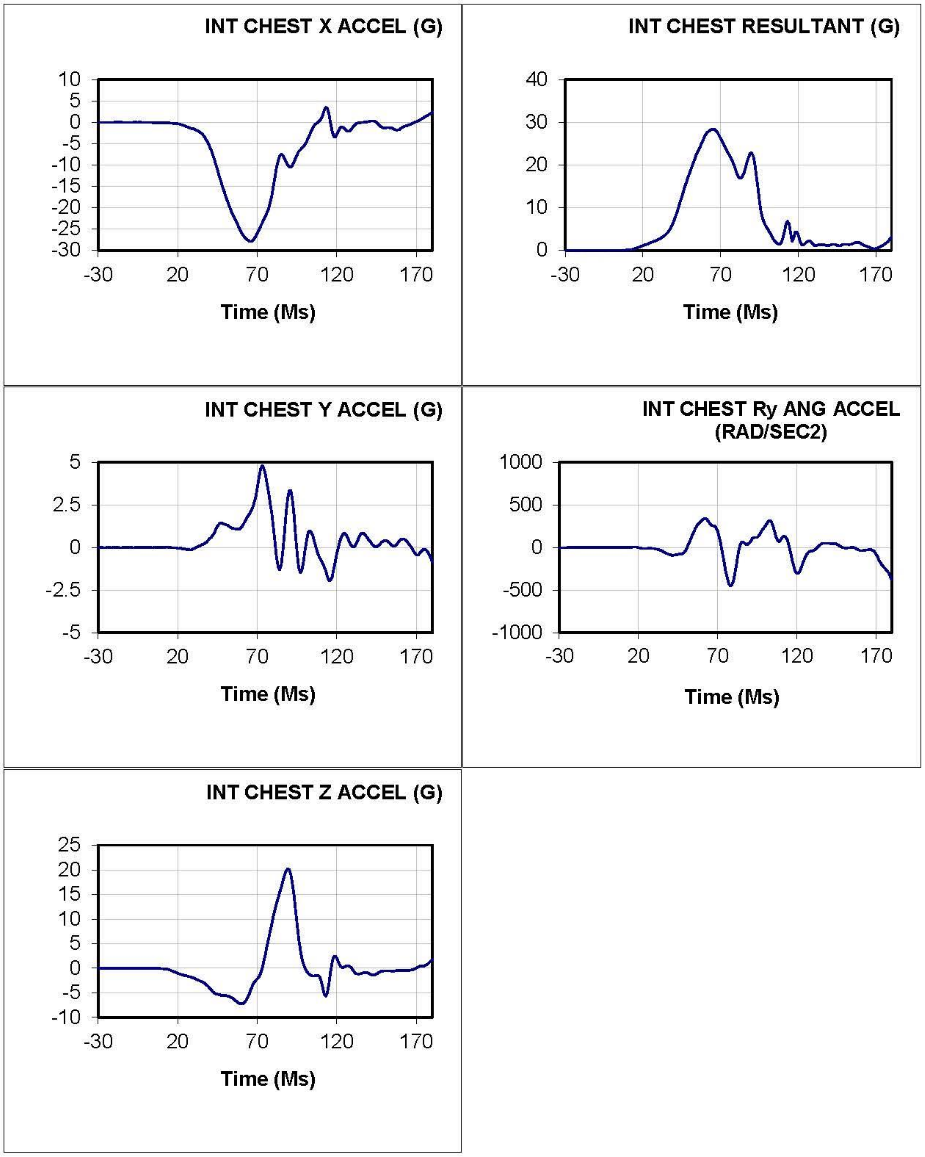


201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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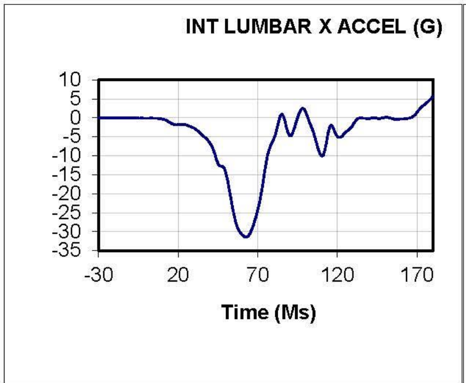
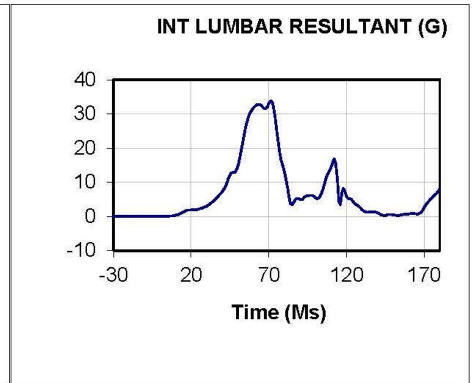
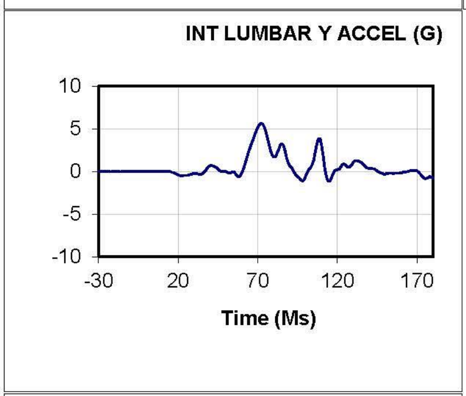
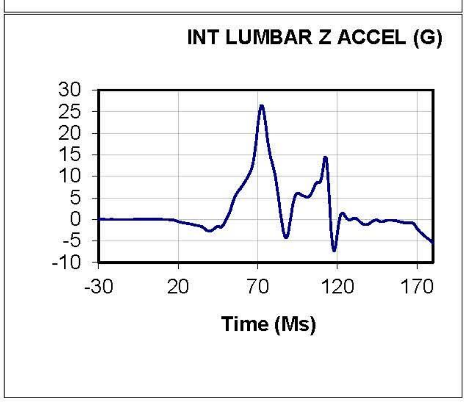
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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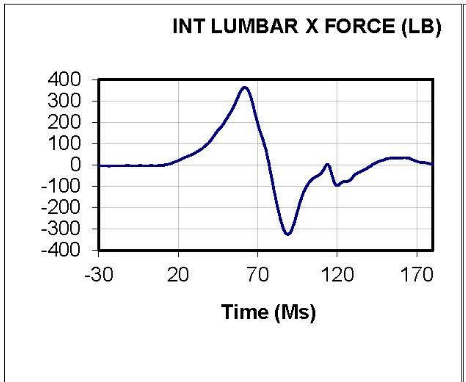
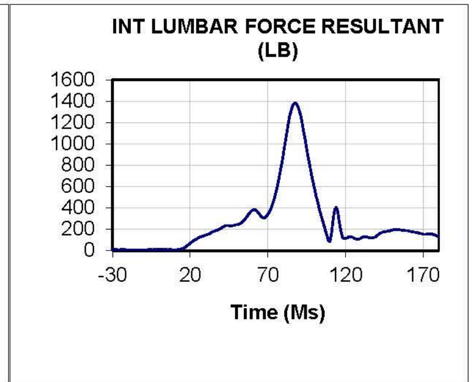
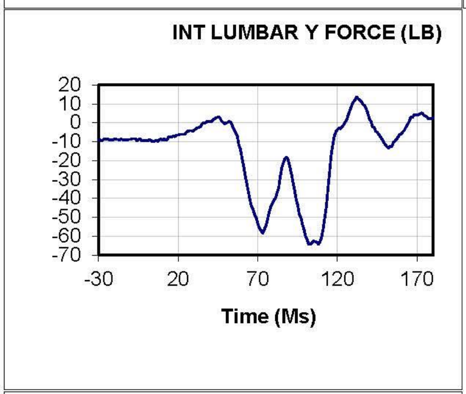
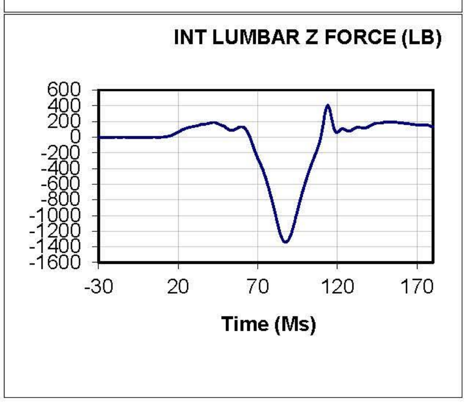
201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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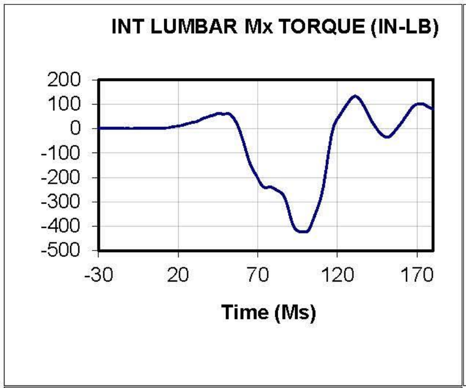
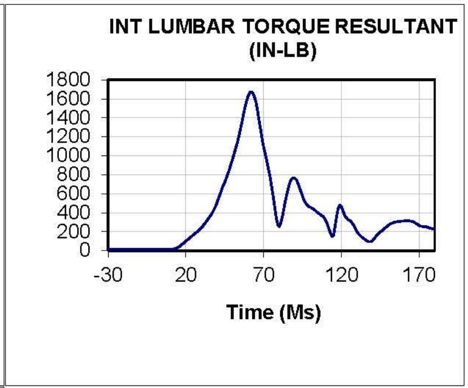
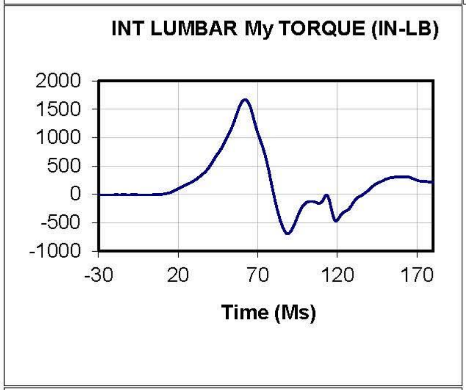
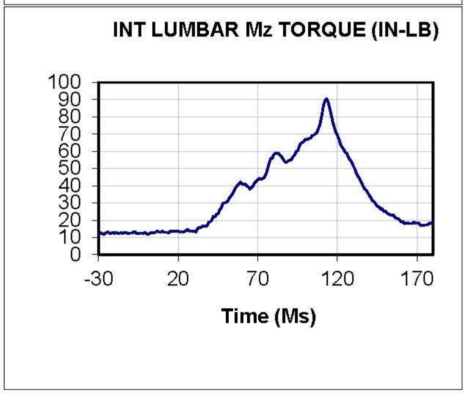
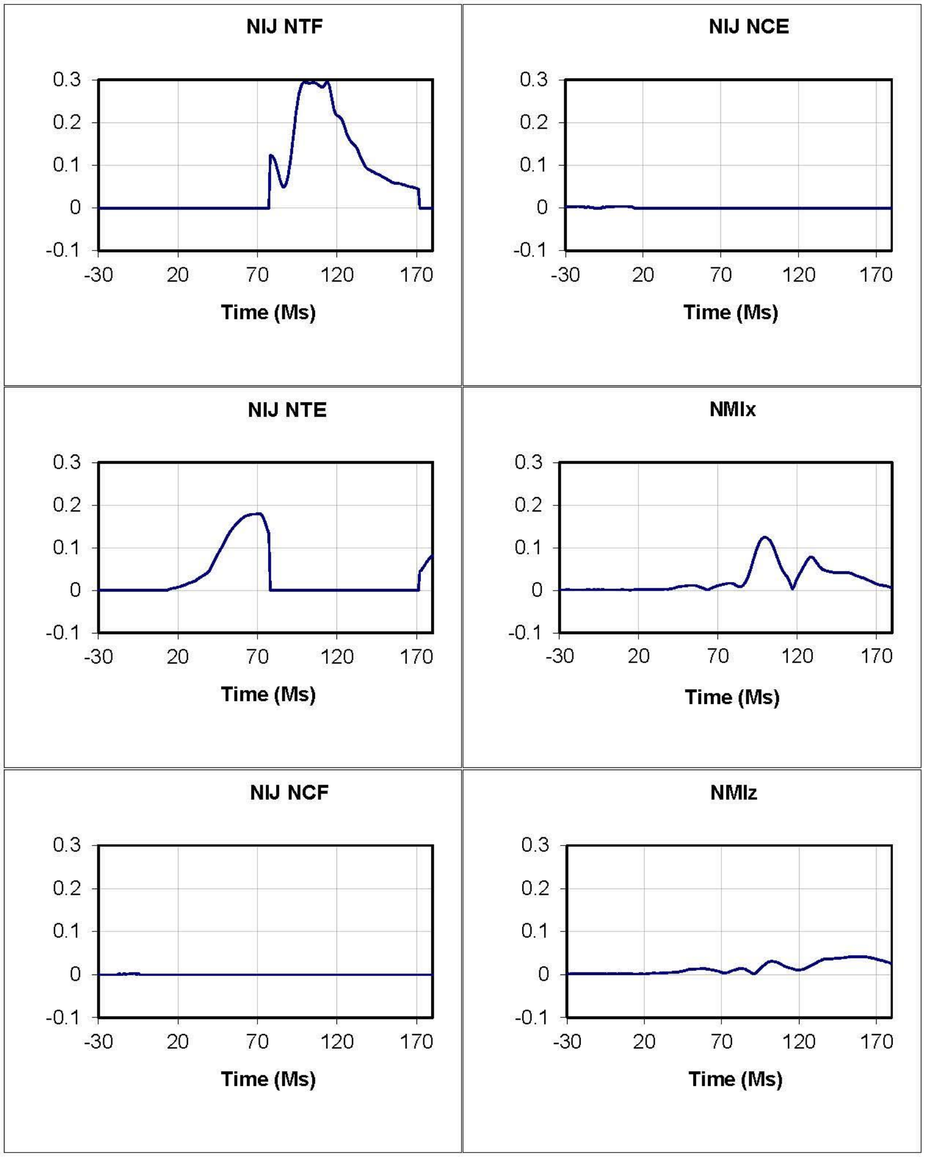

INT LUMBAR Mx TORQUE (IN-LB)
200
100
0
-100
-200
-300
-400
-500
-30
20
70
120
170
Time (Ms)


INT LUMBAR TORQUE RESULTANT (IN-LB)
1800
1600
1400
1200
1000
800
600
400
200
0
-30
20
70
120
170
Time (Ms)


INT LUMBAR My TORQUE (IN-LB)
2000
1500
1000
500
0
-500
-1000
-30
20
70
120
170
Time (Ms)


INT LUMBAR Mz TORQUE (IN-LB)
100
90
80
70
60
50
40
30
20
10
0
-30
20
70
120
170
Time (Ms)

201404 Test: 9103 Test Date: 150528 Subj: LARD Cell: O15

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201404 Test: 8807 Test Date: 140604 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: P15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 8.0 | |
| Impact Rise Time (Ms) | | | | 44.0 | |
| Impact Duration (Ms) | | | | 108.0 | |
| Velocity Change (Ft/Sec) | | 30.43 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.03 | 14.70 | -0.83 | 44.0 | 112.0 |
| SLED Y ACCEL (G) | 0.00 | 0.76 | -0.78 | 11.0 | 17.0 |
| SLED Z ACCEL (G) | 1.00 | 3.10 | -1.66 | 33.0 | 37.0 |
| SLED VELOCITY (FT/SEC) | 0.15 | 27.31 | 0.21 | 195.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.43 | 0.02 | 108.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.03 | 2.88 | -16.86 | 157.0 | 52.0 |
| SEAT Y ACCEL (G) | 0.00 | 0.99 | -1.62 | 140.0 | 174.0 |
| SEAT Z ACCEL (G) | 1.00 | 5.98 | -4.66 | 51.0 | 40.0 |
| SEAT RESULTANT | 1.00 | 17.86 | 0.21 | 52.0 | 110.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -7.23 | -3.24 | -441.72 | 175.0 | 61.0 |
| LEFT LAP Y FORCE (LB) | 8.22 | 386.63 | 2.45 | 61.0 | 175.0 |
| LEFT LAP Z FORCE (LB) | -21.58 | 2.88 | -1390.73 | 185.0 | 61.0 |
| LEFT LAP RESULTANT (LB) | 24.20 | 1509.55 | 4.37 | 61.0 | 175.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -6.76 | -2.82 | -408.23 | 137.0 | 63.0 |
| RIGHT LAP Y FORCE (LB) | 2.55 | 4.16 | -248.39 | 169.0 | 64.0 |
| RIGHT LAP Z FORCE (LB) | -22.92 | 8.51 | -1265.46 | 166.0 | 62.0 |
| RIGHT LAP RESULTANT (LB) | 24.03 | 1351.10 | 4.25 | 62.0 | 153.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -15.17 | 0.00 | -1187.85 | 204.0 | 60.0 |
| LEFT SHOULDER Y FORCE (LB) | 4.16 | 7.91 | -14.68 | 34.0 | 77.0 |
| LEFT SHOULDER Z FORCE (LB) | 3.92 | 259.83 | 2.16 | 65.0 | 208.0 |
| LEFT SHOULDER RESULTANT (LB) | 16.21 | 1214.81 | 4.65 | 60.0 | 198.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -14.21 | 0.90 | -1258.57 | 201.0 | 61.0 |
| RIGHT SHOULDER Y FORCE (LB) | -1.34 | 2.62 | -198.62 | 31.0 | 65.0 |
| RIGHT SHOULDER Z FORCE (LB) | 4.00 | 10.63 | 0.37 | 44.0 | 60.0 |
| RIGHT SHOULDER RESULTANT (LB | 14.83 | 1273.21 | 4.62 | 61.0 | 196.0 |
| | | | | | |
| CROTCH STRAP X FORCE (LB) | -3913.82 | -3913.82 | -3913.82 | 0.0 | 0.0 |
| CROTCH STRAP Y FORCE (LB) | 3996.39 | 3996.39 | 3996.39 | 0.0 | 0.0 |
| CROTCH STRAP Z FORCE (LB) | 4009.30 | 4009.30 | 4009.30 | 0.0 | 0.0 |
| CROTCH STRAP FORCE (LB) | 6882.13 | 6882.13 | 6882.13 | 0.0 | 0.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | 0.00 | 1.00 | -20.16 | 204.0 | 106.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 19.58 | -17.67 | 160.0 | 198.0 |

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201404 Test: 8807 Test Date: 140604 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: P15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT HEAD Z ACCEL (G) | 1.00 | 4.66 | -17.71 | 87.0 | 66.0 |
| INT HEAD RESULTANT (G) | 1.00 | 24.07 | 0.37 | 105.0 | 20.0 |
| INT HEAD HIC | | 58.42 | | 95.0 | 125.0 |
| INT HEAD Ry ANG (RAD/SEC2) | 2.76 | 1268.03 | -974.81 | 60.0 | 120.0 |
| | | | | | |
| INT NECK X FORCE (LB) | 4.43 | 27.96 | -246.76 | 208.0 | 108.0 |
| INT NECK Y FORCE (LB) | -5.91 | 2.85 | -40.58 | 207.0 | 120.0 |
| INT NECK Z FORCE (LB) | -6.88 | 212.15 | -34.68 | 63.0 | 86.0 |
| INT NECK RESULTANT (LB) | 10.10 | 303.16 | 6.07 | 106.0 | 18.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 6.40 | 32.67 | -41.19 | 85.0 | 100.0 |
| INT NECK My TORQUE (IN-LB) | -6.64 | 234.72 | -188.15 | 113.0 | 60.0 |
| INT NECK Mz TORQUE (IN-LB) | -5.13 | 7.22 | -17.76 | 79.0 | 55.0 |
| INT NECK TORQUE RES (IN-LB) | 10.56 | 237.68 | 5.12 | 113.0 | 176.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | -0.03 | 0.46 | -26.93 | 162.0 | 58.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 0.67 | -2.58 | 84.0 | 61.0 |
| INT CHEST Z ACCEL (G) | 0.98 | 13.02 | -4.22 | 86.0 | 60.0 |
| INT CHEST RESULTANT (G) | 0.99 | 27.35 | 0.54 | 58.0 | 19.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.02 | 5.46 | -34.60 | 189.0 | 60.0 |
| INT LUMBAR Y ACCEL (G) | 0.00 | 4.20 | -1.99 | 54.0 | 185.0 |
| INT LUMBAR Z ACCEL (G) | 1.01 | 17.25 | -1.92 | 74.0 | 129.0 |
| INT LUMBAR RESULTANT (G) | 1.01 | 34.76 | 0.06 | 60.0 | 153.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | -14.37 | 54.61 | -331.11 | 45.0 | 88.0 |
| INT LUMBAR Y FORCE (LB) | -11.09 | 13.57 | -37.27 | 99.0 | 54.0 |
| INT LUMBAR Z FORCE (LB) | -18.87 | 212.86 | -927.25 | 130.0 | 81.0 |
| INT LUMBAR FORCE RESULTANT ( | 26.19 | 972.12 | 12.43 | 82.0 | 16.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | -38.51 | 219.67 | -113.79 | 85.0 | 180.0 |
| INT LUMBAR My TORQUE (IN-LB) | -47.88 | 223.71 | -1778.76 | 43.0 | 87.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -17.05 | 19.43 | -22.85 | 204.0 | 76.0 |
| INT LUMBAR TORQUE RESULTANT | 63.77 | 1791.23 | 38.20 | 87.0 | 18.0 |

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201404 Test: 8807 Test Date: 140604 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: P15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 28.44 | -246.76 | 217.0 | 108.0 |
| NIJ TENSION (LB) | | 212.15 | | 63.0 | |
| NIJ COMPRESSION (LB) | | -34.68 | | 86.0 | |
| NIJ FLEXION (IN-LB) | | 404.97 | | 113.0 | |
| NIJ EXTENSION (IN-LB) | | 123.64 | | 58.0 | |
| NIJ NTF | 0.0000 | 0.2004 | 0.0000 | 112.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.1873 | 0.0000 | 60.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.0584 | 0.0000 | 90.0 | 0.0 |
| NIJ NCE | 0.0103 | 0.0109 | 0.0000 | 2.0 | 19.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.14 | | | |
| NIJ NTF AIS >= 3 | | 0.06 | | | |
| NIJ NTF AIS >= 4 | | 0.08 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.14 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.08 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.12 | | | |
| NIJ NCF AIS >= 3 | | 0.04 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.12 | | | |
| NIJ NCE AIS >= 3 | | 0.04 | | | |
| NIJ NCE AIS >= 4 | | 0.06 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0040 | 0.0260 | 0.0000 | 100.0 | 162.0 |
| NMIz | 0.0000 | 0.0000 | 0.0000 | 0.0 | 0.0 |

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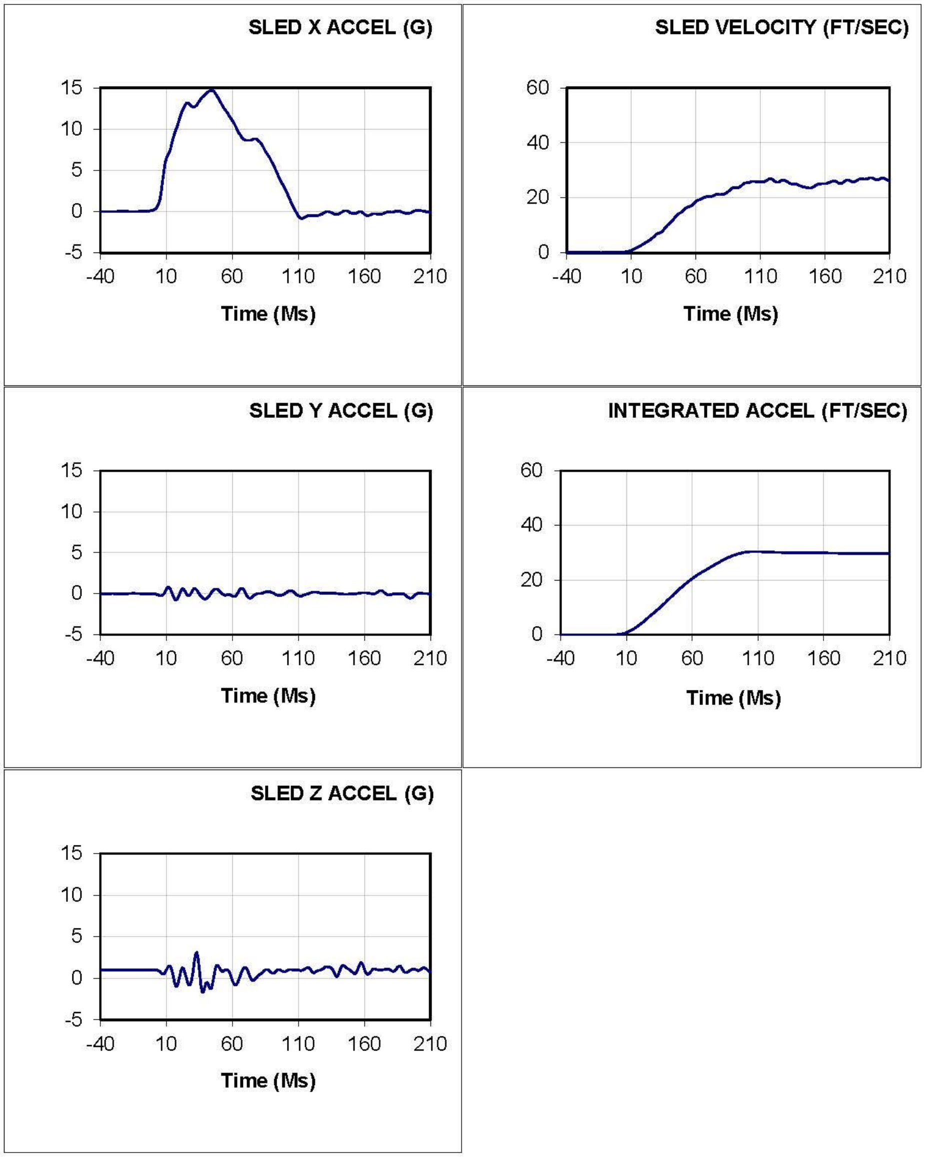
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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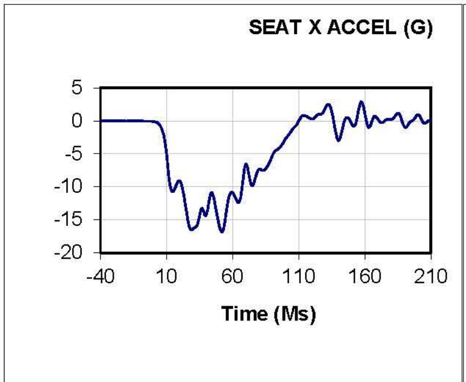
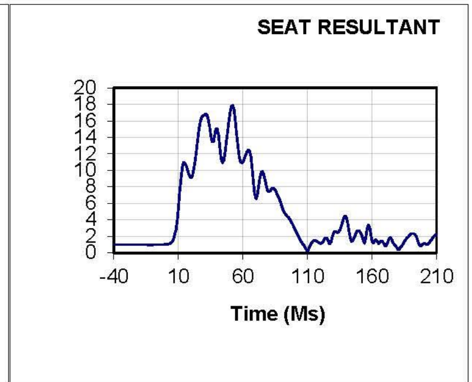
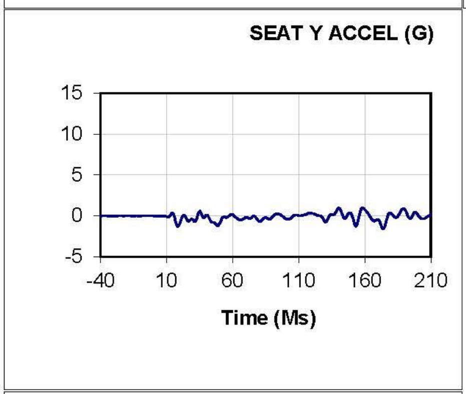
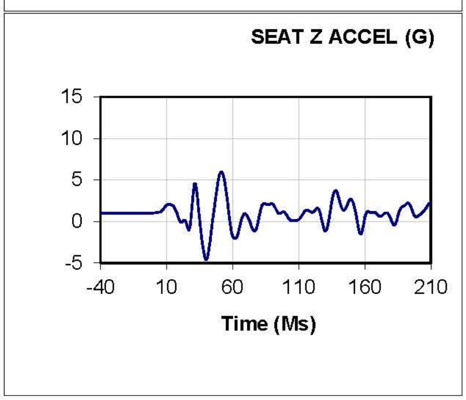
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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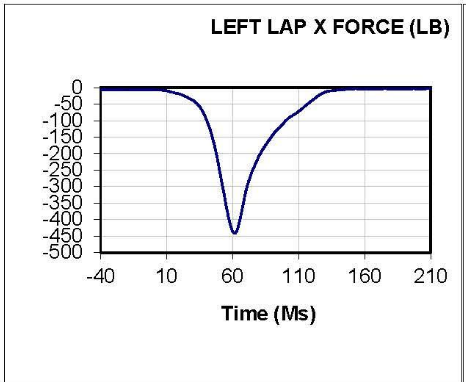
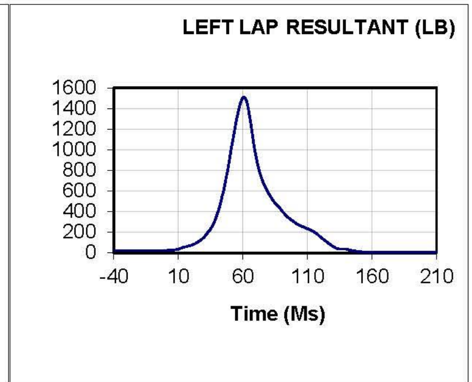
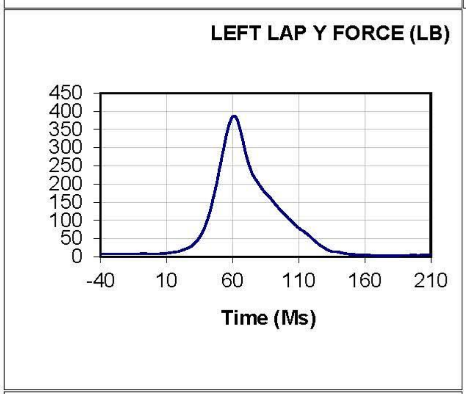
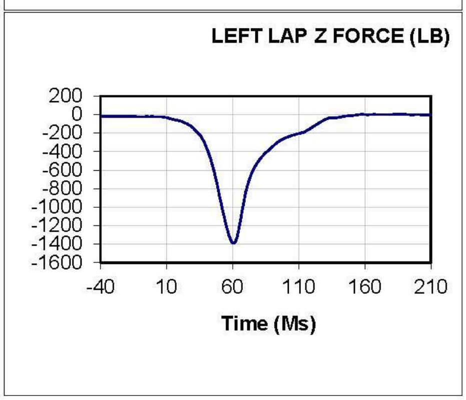
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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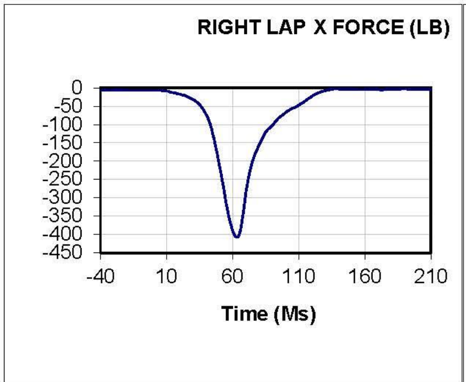
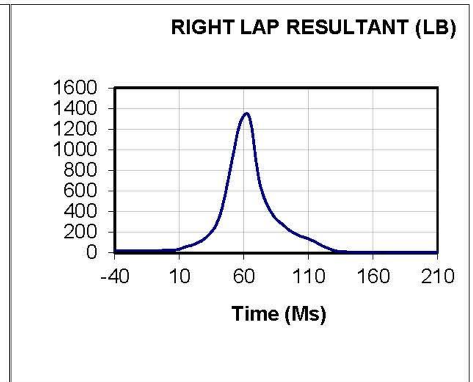
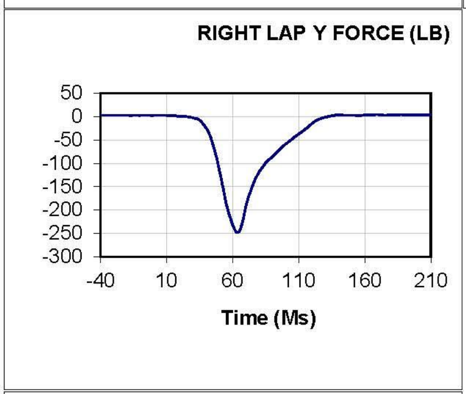
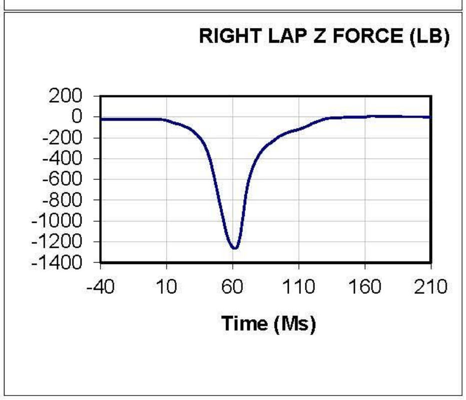
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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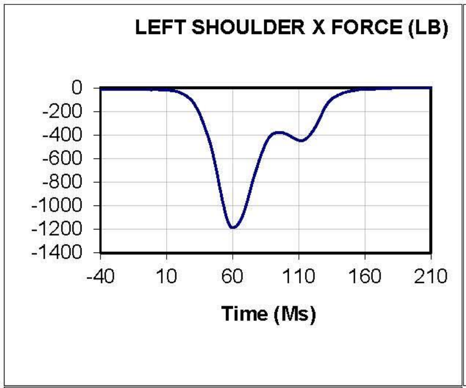
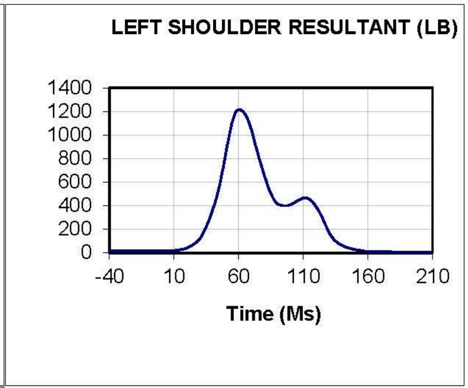
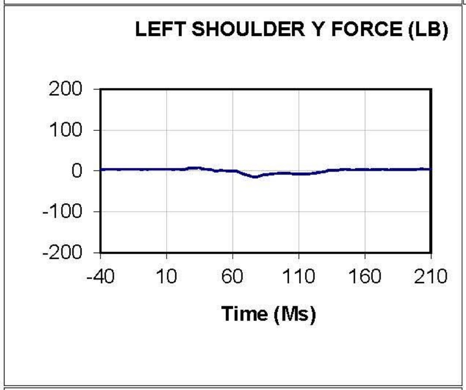
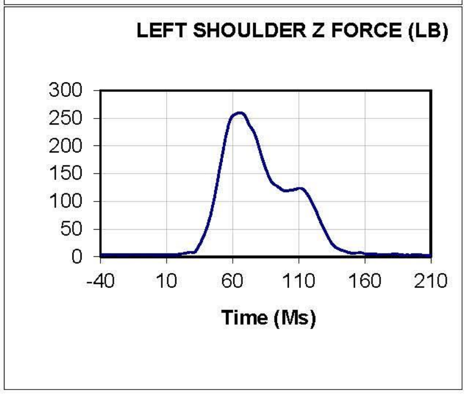
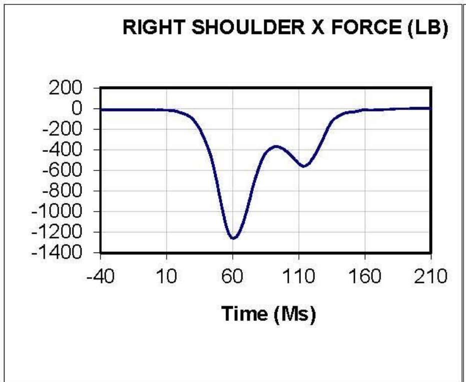

LEFT SHOULDER X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-1400
-40
10
60
110
160
210
Time (Ms)

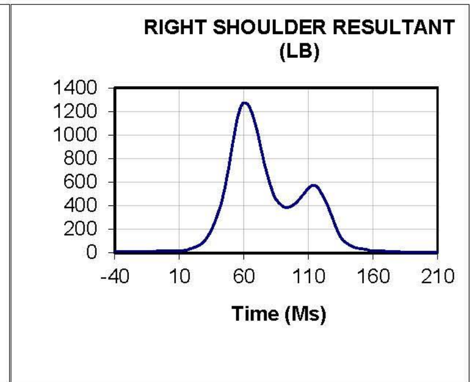

LEFT SHOULDER RESULTANT (LB)
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
210
Time (Ms)


LEFT SHOULDER Y FORCE (LB)
200
100
0
-100
-200
-40
10
60
110
160
210
Time (Ms)

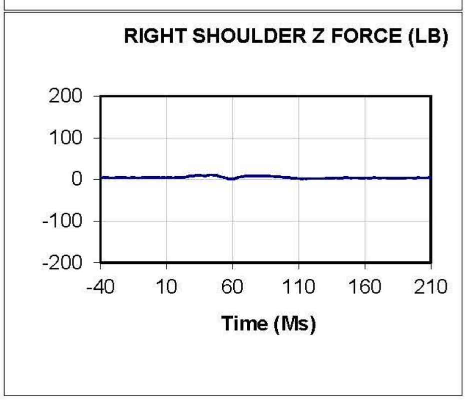

LEFT SHOULDER Z FORCE (LB)
300
250
200
150
100
50
0
-40
10
60
110
160
210
Time (Ms)

201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15





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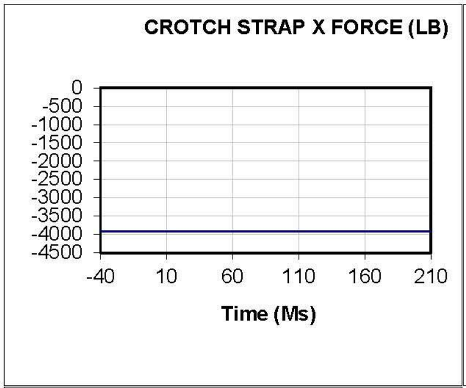
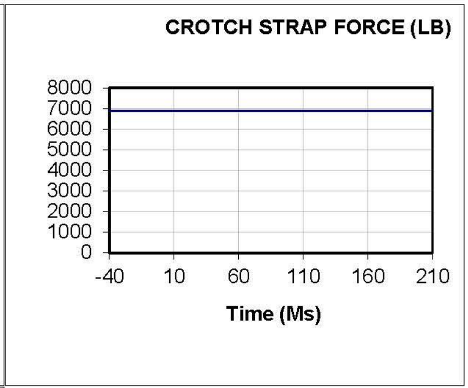
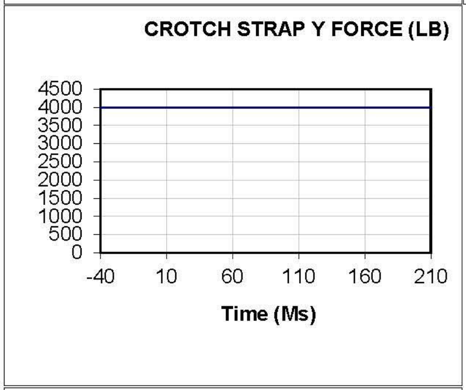
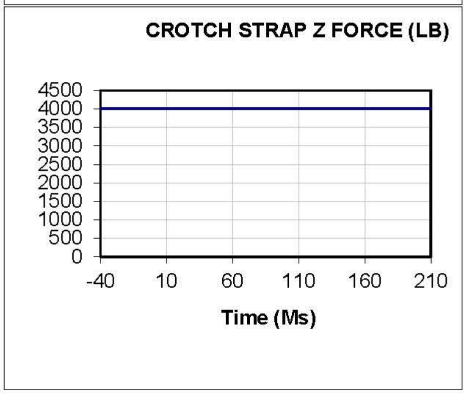
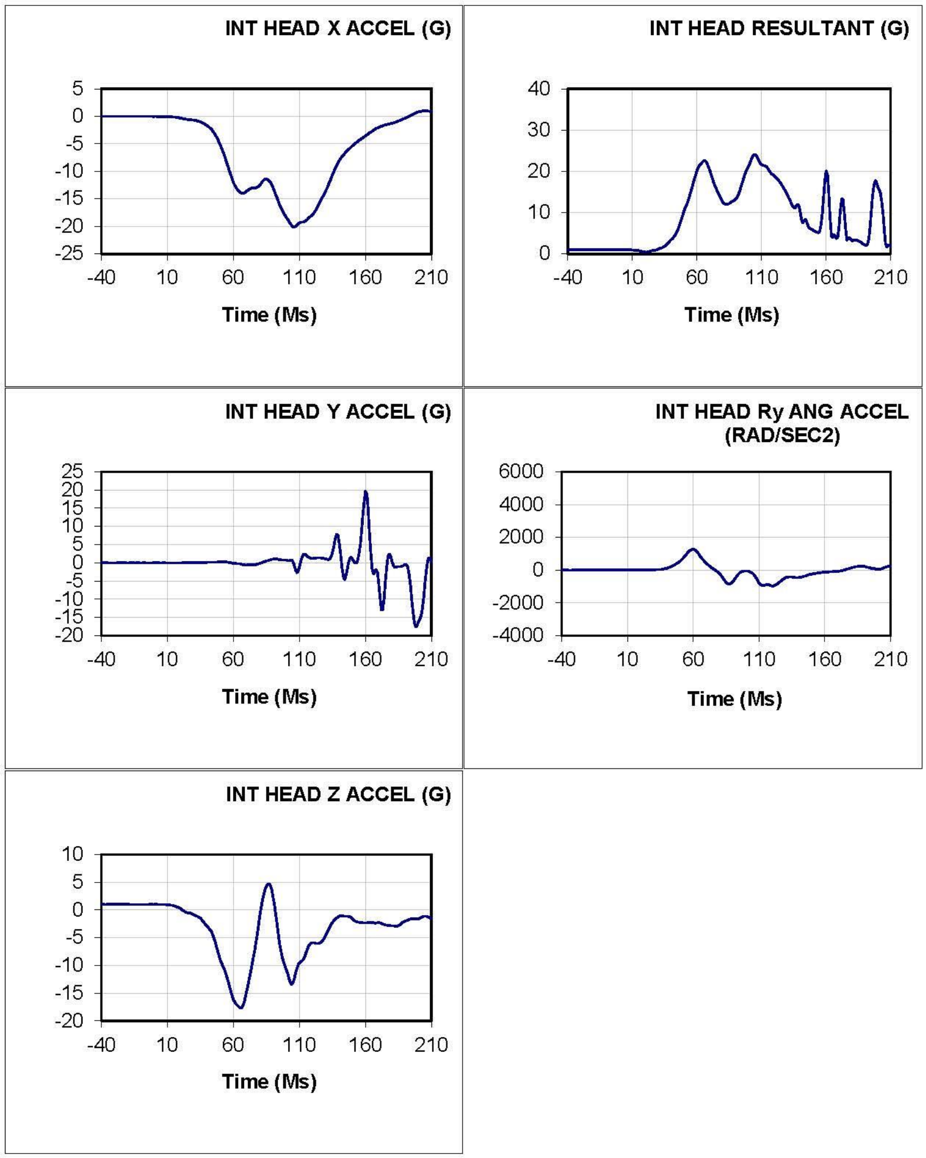

CROTCH STRAP X FORCE (LB)
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-40
10
60
110
160
210
Time (Ms)


CROTCH STRAP FORCE (LB)
8000
7000
6000
5000
4000
3000
2000
1000
0
-40
10
60
110
160
210
Time (Ms)

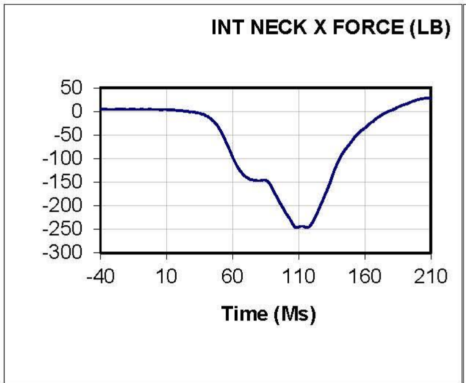

CROTCH STRAP Y FORCE (LB)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-40
10
60
110
160
210
Time (Ms)

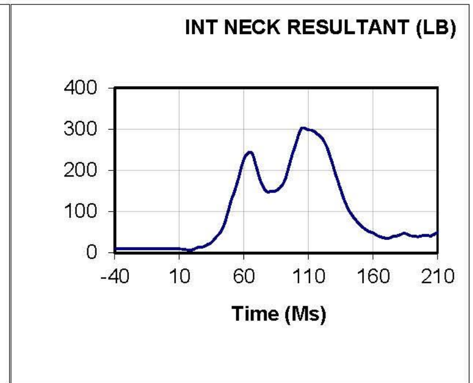

CROTCH STRAP Z FORCE (LB)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-40
10
60
110
160
210
Time (Ms)

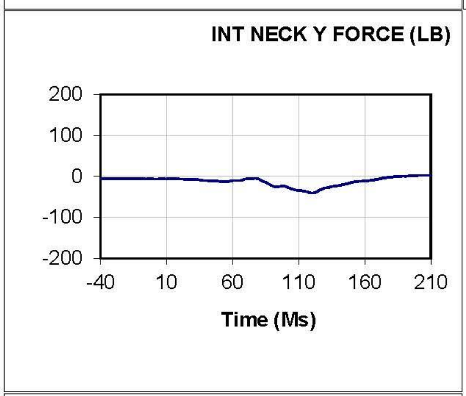
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

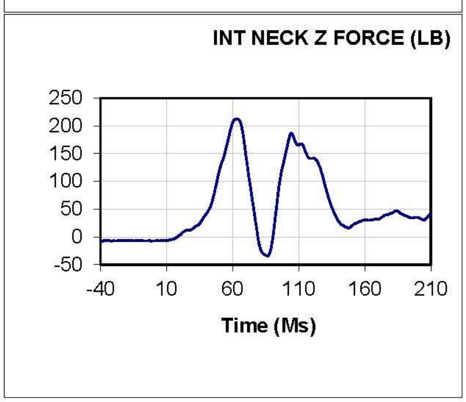


201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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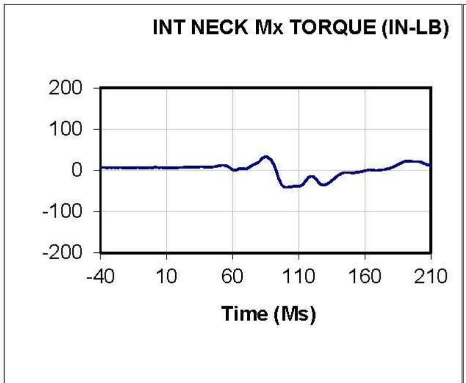
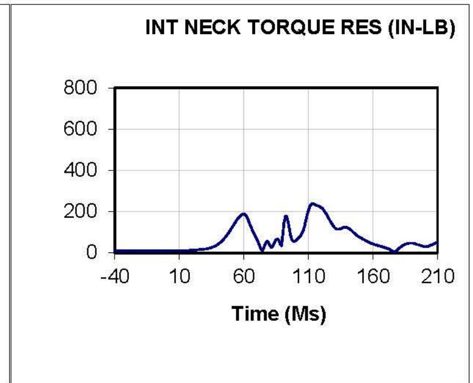
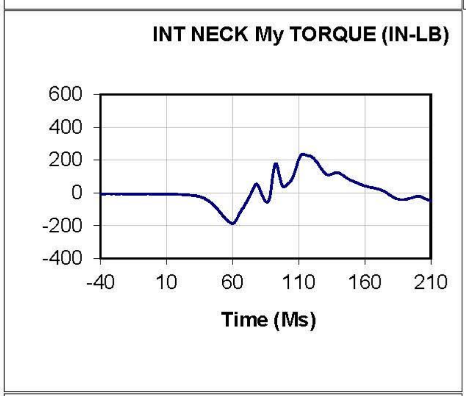
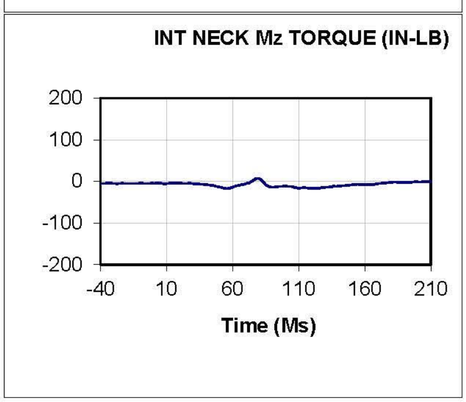
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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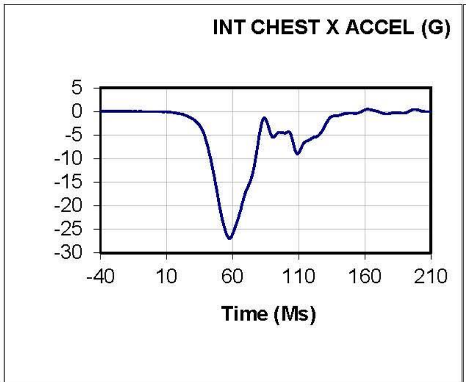
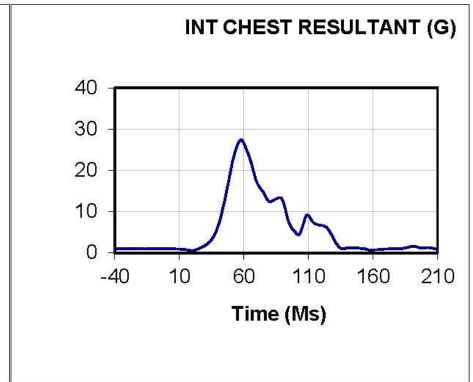
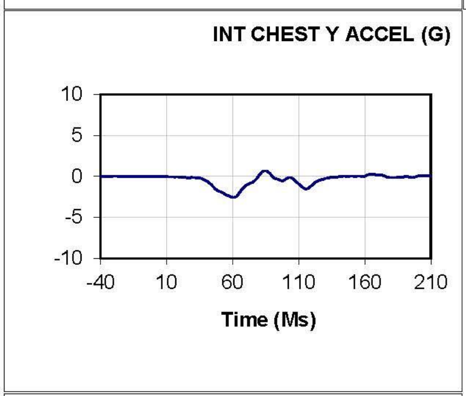
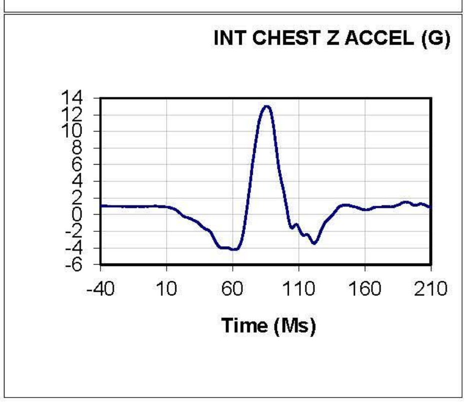
201404  Test: 8807  Test Date: 140604  Subj: LARD  Cell: P15

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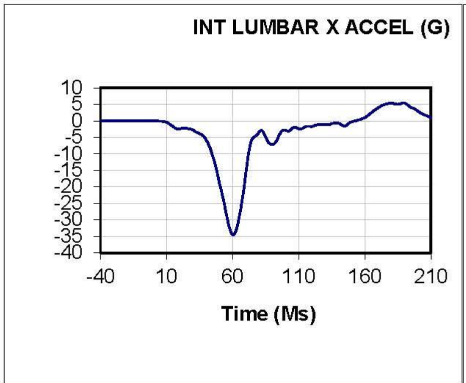
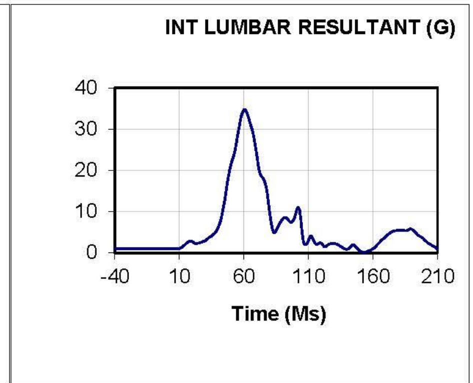
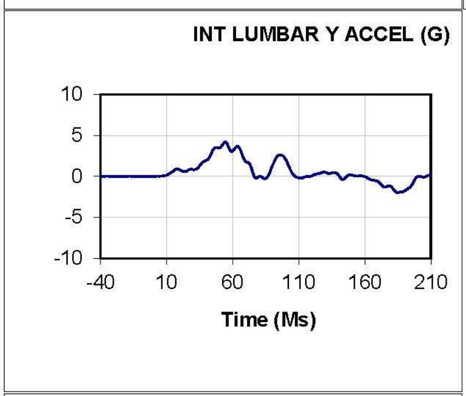
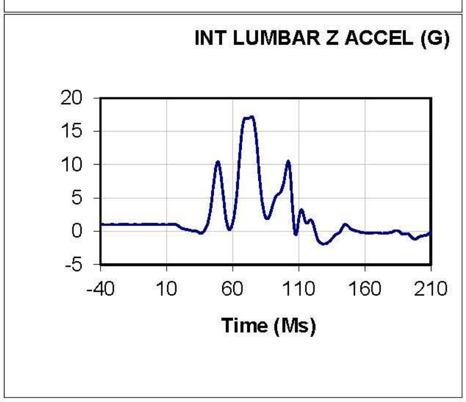
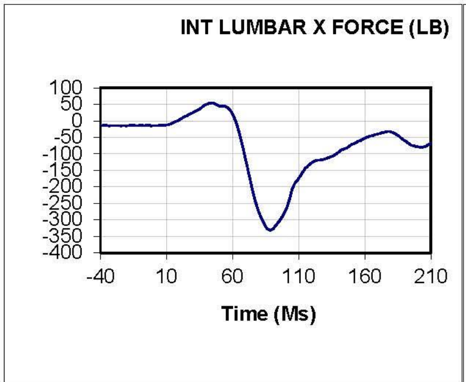
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

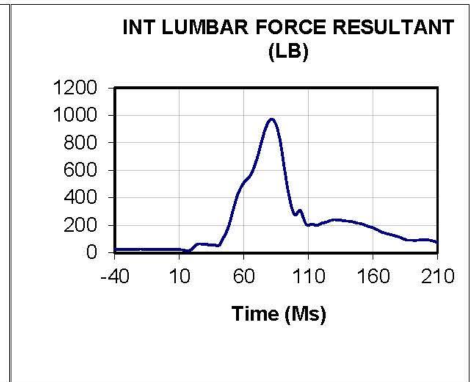


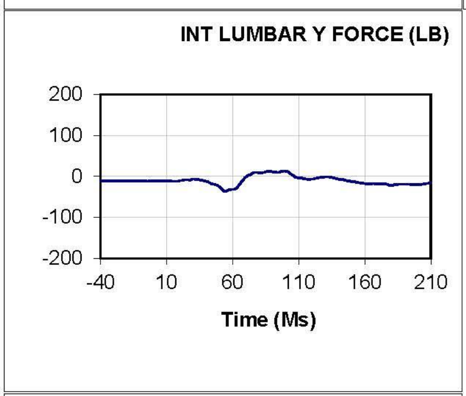



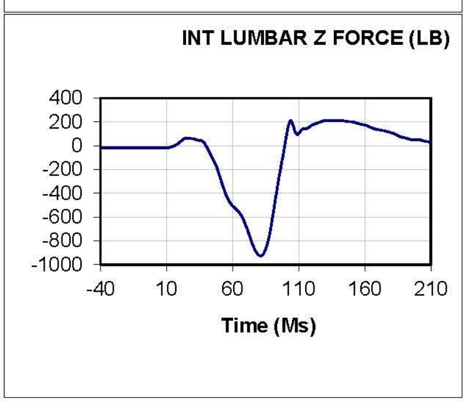



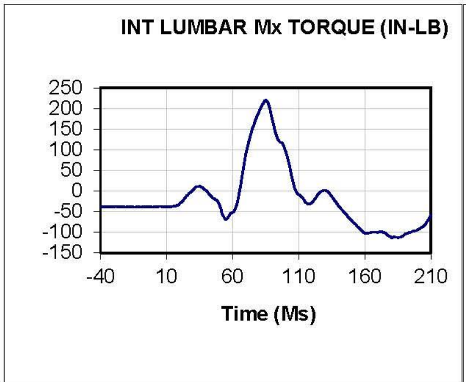

INT LUMBAR X FORCE (LB)
100 50 0 -50 -100 -150 -200 -250 -300 -350 -400
-40 10 60 110 160 210
Time (Ms)

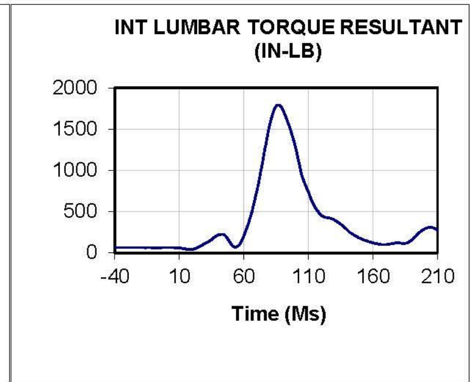

INT LUMBAR FORCE RESULTANT (LB)
1200 1000 800 600 400 200 0
-40 10 60 110 160 210
Time (Ms)

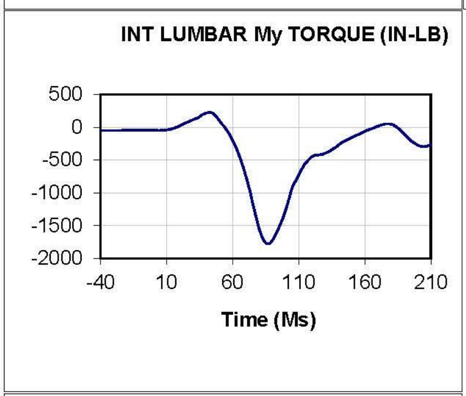

INT LUMBAR Y FORCE (LB)
200 100 0 -100 -200
-40 10 60 110 160 210
Time (Ms)

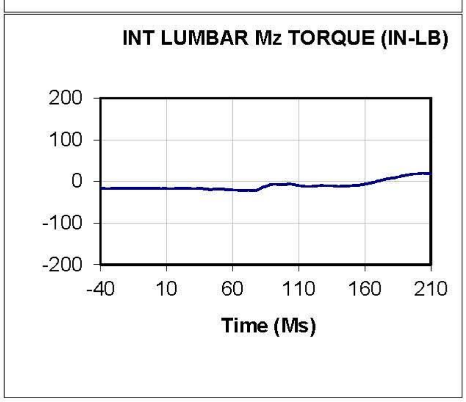

INT LUMBAR Z FORCE (LB)
400 200 0 -200 -400 -600 -800 -1000
-40 10 60 110 160 210
Time (Ms)

201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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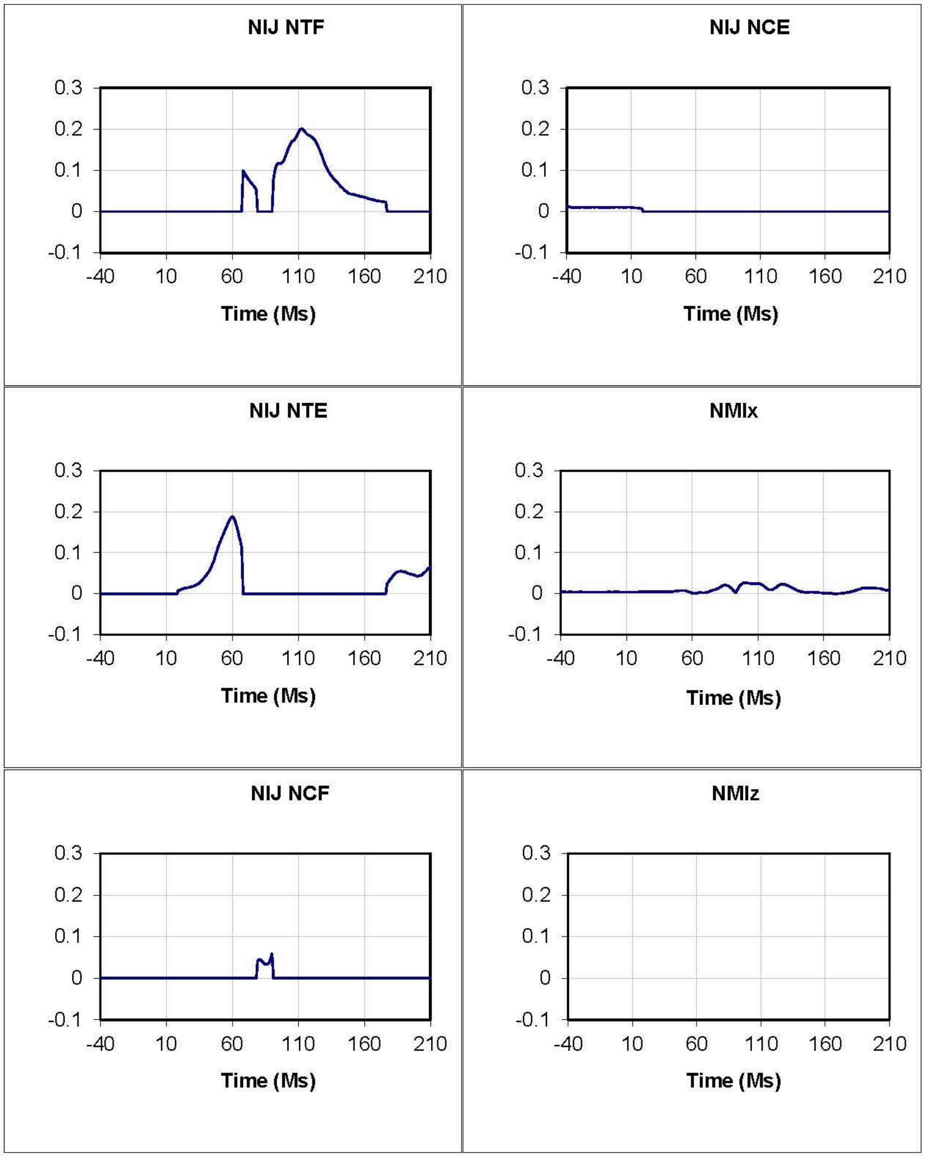
201404 Test: 8807 Test Date: 140604 Subj: LARD Cell: P15

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201502 Test: 9011 Test Date: 150309 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: Q15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 7.0 | |
| Impact Rise Time (Ms) | | | | 44.0 | |
| Impact Duration (Ms) | | | | 107.0 | |
| Velocity Change (Ft/Sec) | | 30.90 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.01 | 15.07 | -0.92 | 44.0 | 111.0 |
| SLED Y ACCEL (G) | 0.00 | 1.54 | -0.88 | 16.0 | 11.0 |
| SLED Z ACCEL (G) | 1.00 | 3.33 | -1.65 | 32.0 | 27.0 |
| SLED VELOCITY (FT/SEC) | 0.18 | 30.92 | 0.17 | 111.0 | 1.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.90 | 0.02 | 107.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.01 | 2.32 | -17.62 | 118.0 | 33.0 |
| SEAT Y ACCEL (G) | 0.01 | 1.16 | -1.73 | 126.0 | 89.0 |
| SEAT Z ACCEL (G) | 1.00 | 5.84 | -5.72 | 40.0 | 52.0 |
| SEAT RESULTANT | 1.00 | 17.99 | 0.46 | 32.0 | 135.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -17.34 | -0.59 | -825.09 | 152.0 | 66.0 |
| LEFT LAP Y FORCE (LB) | -0.22 | 372.69 | -3.38 | 66.0 | 175.0 |
| LEFT LAP Z FORCE (LB) | 8.92 | 501.02 | -0.13 | 67.0 | 140.0 |
| LEFT LAP RESULTANT (LB) | 19.51 | 1034.07 | 2.65 | 66.0 | 152.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -15.63 | -2.05 | -979.48 | 174.0 | 62.0 |
| RIGHT LAP Y FORCE (LB) | 2.34 | 451.09 | -2.48 | 63.0 | 128.0 |
| RIGHT LAP Z FORCE (LB) | -1.96 | 327.25 | -3.99 | 65.0 | 171.0 |
| RIGHT LAP RESULTANT (LB) | 15.93 | 1123.72 | 4.34 | 63.0 | 149.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -20.67 | -20.51 | -1600.32 | 0.0 | 60.0 |
| LEFT SHOULDER Y FORCE (LB) | 2.88 | 39.99 | 0.94 | 59.0 | 19.0 |
| LEFT SHOULDER Z FORCE (LB) | 3.96 | 309.40 | 2.44 | 64.0 | 13.0 |
| LEFT SHOULDER RESULTANT (LB) | 21.25 | 1627.55 | 21.05 | 60.0 | 6.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -22.14 | -20.52 | -1507.58 | 177.0 | 59.0 |
| RIGHT SHOULDER Y FORCE (LB) | 1.63 | 2.77 | -41.06 | 152.0 | 61.0 |
| RIGHT SHOULDER Z FORCE (LB) | 2.85 | 301.39 | 1.63 | 64.0 | 10.0 |
| RIGHT SHOULDER RESULTANT (LB) | 22.38 | 1533.79 | 21.14 | 59.0 | 177.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | -0.01 | 0.05 | -17.74 | 15.0 | 67.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 2.64 | -0.78 | 108.0 | 52.0 |
| INT HEAD Z ACCEL (G) | 0.97 | 8.09 | -19.20 | 87.0 | 64.0 |
| INT HEAD RESULTANT (G) | 0.97 | 25.69 | 0.20 | 65.0 | 17.0 |
| INT HEAD HIC | | 62.93 | | 45.0 | 75.0 |
| INT HEAD Ry ANG (RAD/SEC2) | 0.68 | 894.38 | -1235.68 | 52.0 | 115.0 |

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201502 Test: 9011 Test Date: 150309 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: Q15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | -12.30 | -11.93 | -282.25 | 1.0 | 122.0 |
| INT NECK Y FORCE (LB) | -1.67 | 13.80 | -23.31 | 75.0 | 109.0 |
| INT NECK Z FORCE (LB) | -10.28 | 357.20 | -49.30 | 64.0 | 87.0 |
| INT NECK RESULTANT (LB) | 16.13 | 396.75 | 16.39 | 64.0 | 2.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 4.23 | 40.72 | -35.09 | 92.0 | 123.0 |
| INT NECK My TORQUE (IN-LB) | 8.68 | 344.33 | -166.71 | 114.0 | 56.0 |
| INT NECK Mz TORQUE (IN-LB) | -0.97 | 8.11 | -29.10 | 31.0 | 140.0 |
| INT NECK TORQUE RES (IN-LB) | 9.73 | 344.81 | 4.85 | 114.0 | 13.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | -0.02 | 3.50 | -29.58 | 87.0 | 54.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 1.20 | -2.07 | 112.0 | 102.0 |
| INT CHEST Z ACCEL (G) | 1.00 | 14.83 | -8.49 | 94.0 | 49.0 |
| INT CHEST RESULTANT (G) | 1.00 | 30.64 | 0.16 | 54.0 | 17.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.02 | 3.16 | -36.80 | 177.0 | 62.0 |
| INT LUMBAR Y ACCEL (G) | 0.01 | 3.04 | -5.67 | 107.0 | 69.0 |
| INT LUMBAR Z ACCEL (G) | 1.01 | 4.47 | -15.00 | 140.0 | 71.0 |
| INT LUMBAR RESULTANT (G) | 1.01 | 37.13 | 0.65 | 62.0 | 121.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | 22.87 | 423.04 | -16.07 | 93.0 | 43.0 |
| INT LUMBAR Y FORCE (LB) | -4.43 | 28.69 | -14.17 | 94.0 | 118.0 |
| INT LUMBAR Z FORCE (LB) | -28.23 | 234.78 | -1036.15 | 135.0 | 79.0 |
| INT LUMBAR FORCE RESULTANT (LB) | 36.60 | 1081.33 | 10.07 | 80.0 | 32.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | -12.98 | 39.32 | -215.25 | 117.0 | 95.0 |
| INT LUMBAR My TORQUE (IN-LB) | -90.16 | 48.13 | -2408.75 | 36.0 | 91.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -3.86 | 8.89 | -18.99 | 145.0 | 89.0 |
| INT LUMBAR TORQUE RESULTANT (IN-LB) | 91.17 | 2415.49 | 4.08 | 91.0 | 167.0 |

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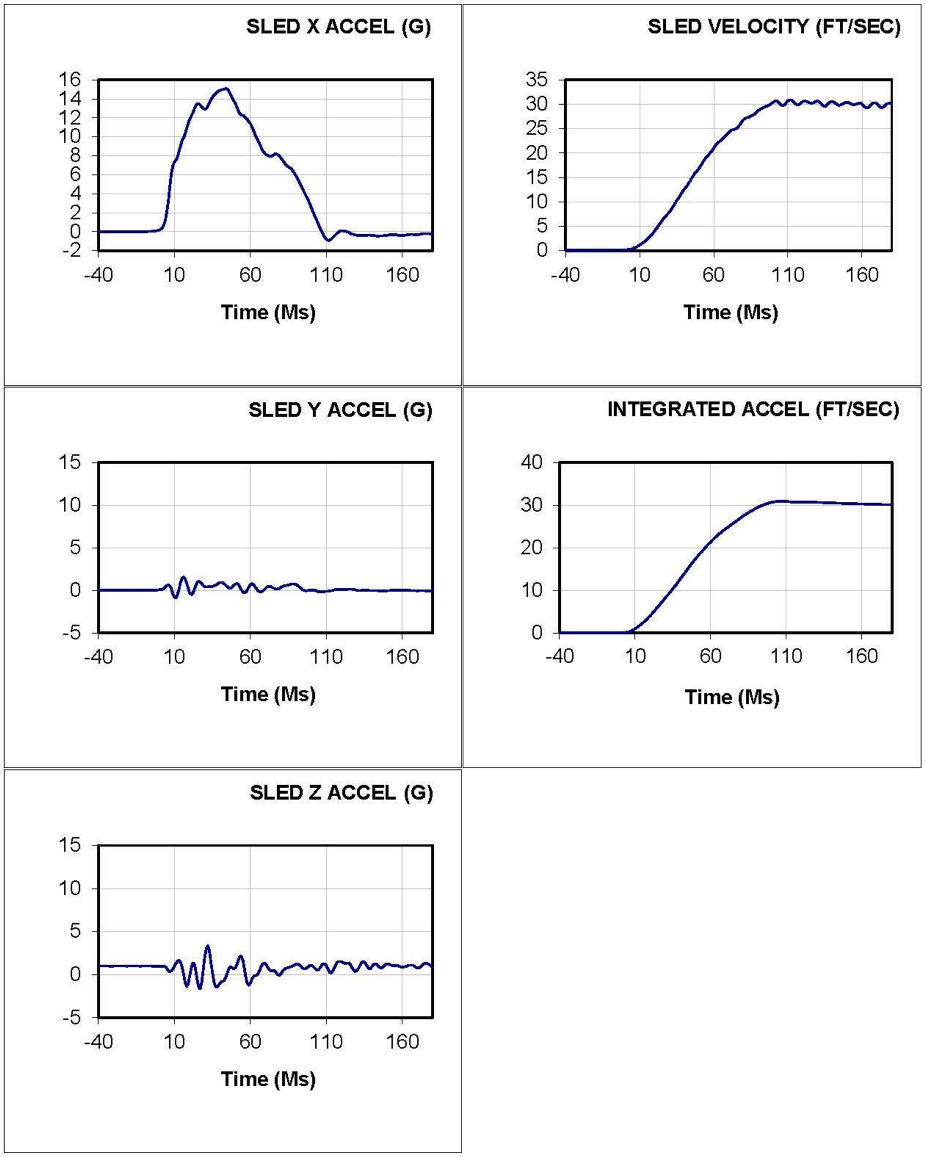
201502 Test: 9011 Test Date: 150309 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: Q15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 1.18 | -282.25 | 186.0 | 122.0 |
| NIJ TENSION (LB) | | 357.20 | | 64.0 | |
| NIJ COMPRESSION (LB) | | -49.30 | | 87.0 | |
| NIJ FLEXION (IN-LB) | | 535.60 | | 114.0 | |
| NIJ EXTENSION (IN-LB) | | 86.35 | | 53.0 | |
| NIJ NTF | 0.0000 | 0.2606 | 0.0000 | 117.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.2200 | 0.0000 | 63.0 | 0.0 |
| NIJ NCF | 0.0109 | 0.1256 | 0.0000 | 86.0 | 20.0 |
| NIJ NCE | 0.0000 | 0.0000 | 0.0000 | 0.0 | 0.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.15 | | | |
| NIJ NTF AIS >= 3 | | 0.06 | | | |
| NIJ NTF AIS >= 4 | | 0.08 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.14 | | | |
| NIJ NTE AIS >= 3 | | 0.06 | | | |
| NIJ NTE AIS >= 4 | | 0.08 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.13 | | | |
| NIJ NCF AIS >= 3 | | 0.05 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.11 | | | |
| NIJ NCE AIS >= 3 | | 0.04 | | | |
| NIJ NCE AIS >= 4 | | 0.06 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0027 | 0.0257 | 0.0001 | 92.0 | 32.0 |
| NMIz | 0.0006 | 0.0184 | 0.0000 | 140.0 | 15.0 |

201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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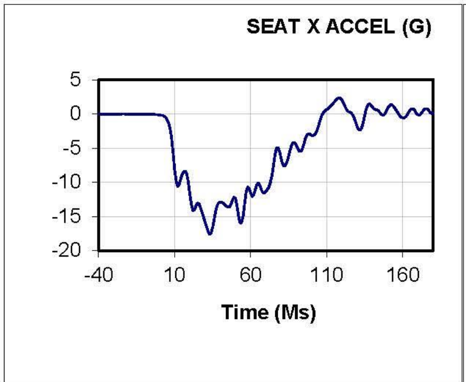
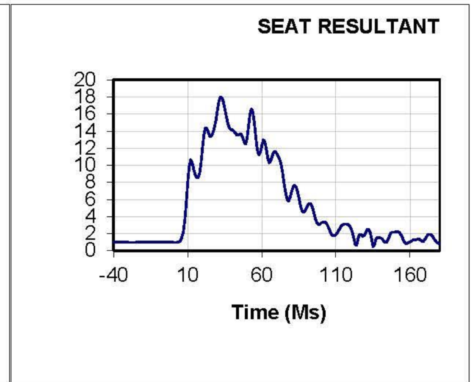
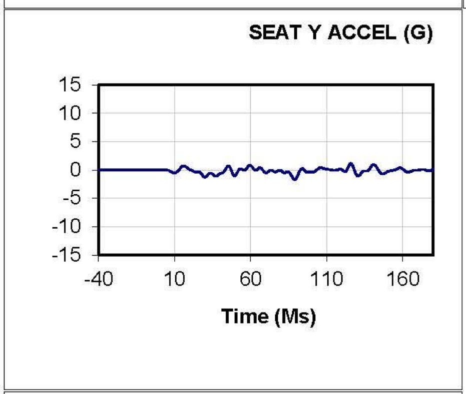
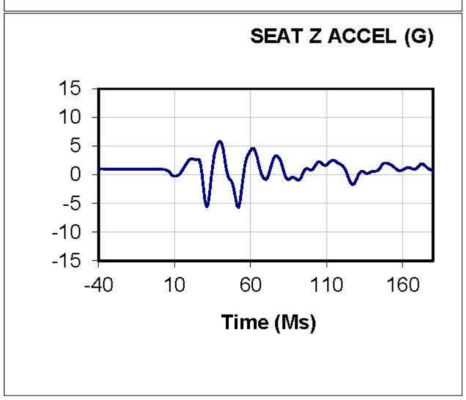
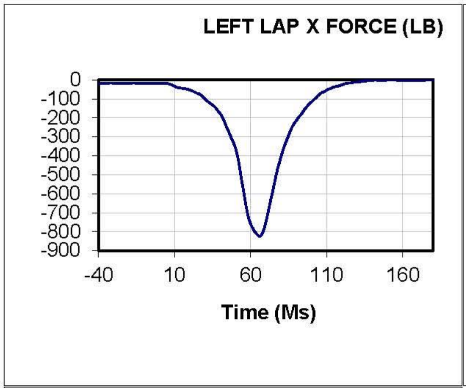

SEAT X ACCEL (G)
5
0
-5
-10
-15
-20
-40
10
60
110
160
Time (Ms)

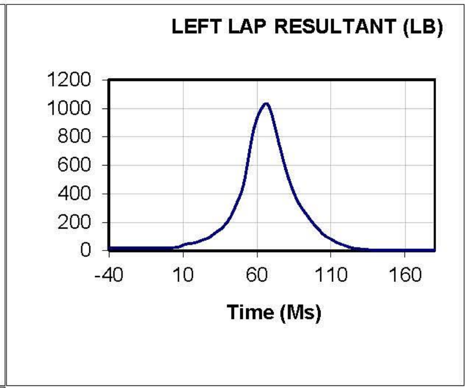

SEAT RESULTANT
20
18
16
14
12
10
8
6
4
2
0
-40
10
60
110
160
Time (Ms)

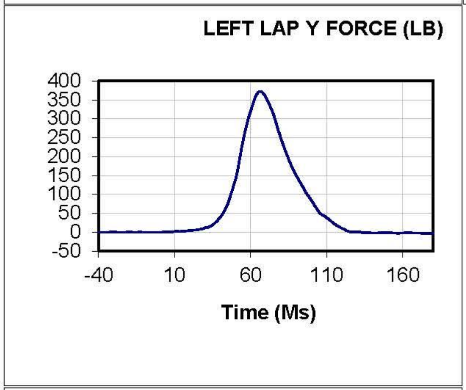

SEAT Y ACCEL (G)
15
10
5
0
-5
-10
-15
-40
10
60
110
160
Time (Ms)

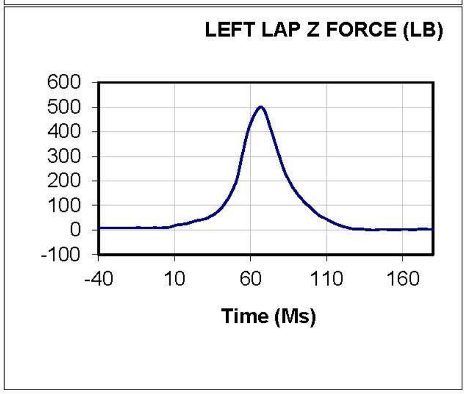

SEAT Z ACCEL (G)
15
10
5
0
-5
-10
-15
-40
10
60
110
160
Time (Ms)

201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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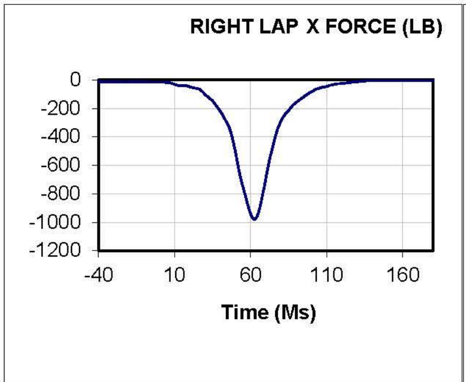
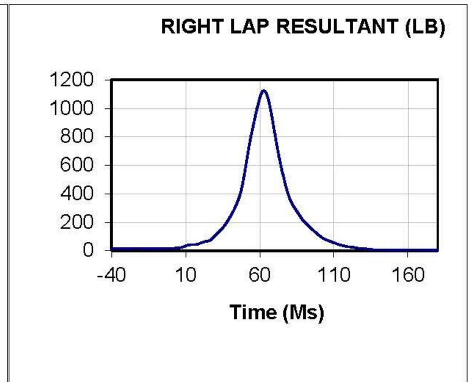
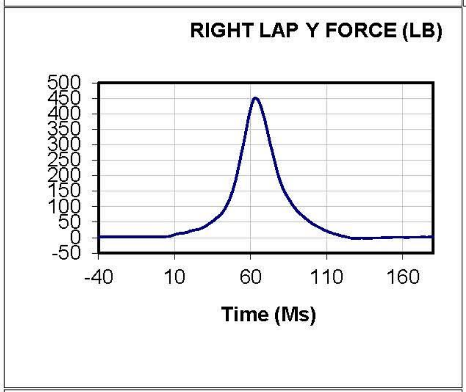
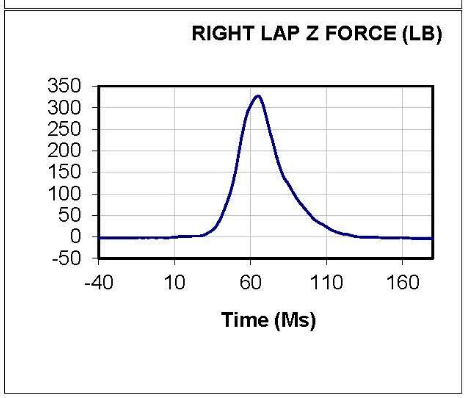
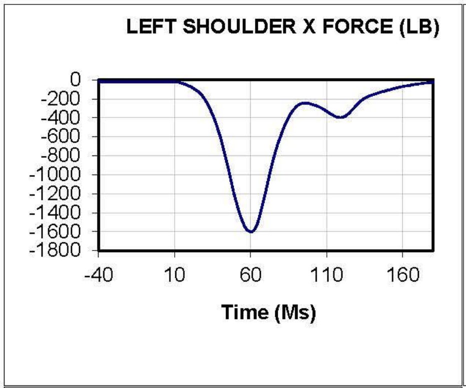
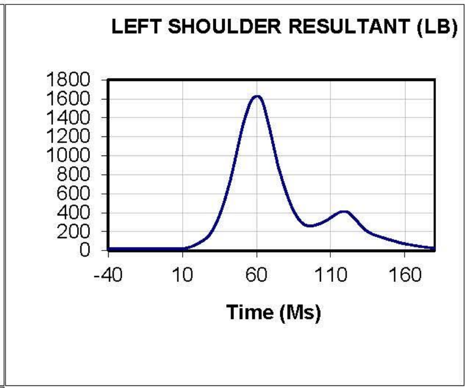

RIGHT LAP X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-40
10
60
110
160
Time (Ms)


RIGHT LAP RESULTANT (LB)
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)


RIGHT LAP Y FORCE (LB)
500
450
400
350
300
250
200
150
100
50
0
-50
-40
10
60
110
160
Time (Ms)

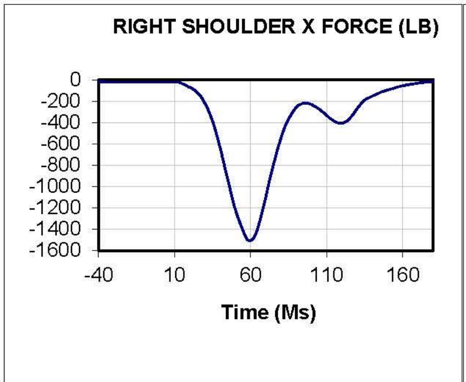

RIGHT LAP Z FORCE (LB)
350
300
250
200
150
100
50
0
-50
-40
10
60
110
160
Time (Ms)

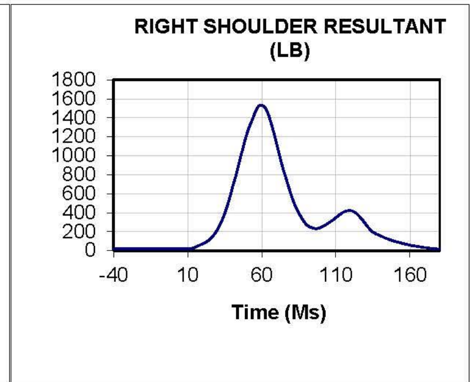

LEFT SHOULDER X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-40
10
60
110
160
Time (Ms)


LEFT SHOULDER RESULTANT (LB)
1800
1600
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)

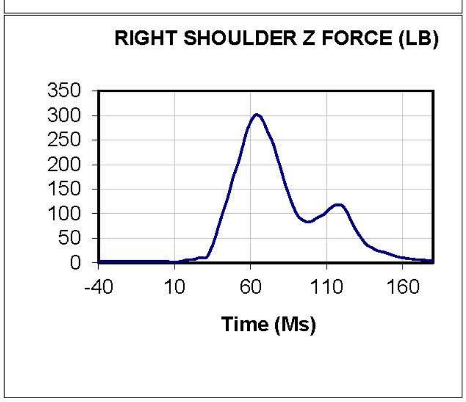

LEFT SHOULDER Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)


LEFT SHOULDER Z FORCE (LB)
350
300
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

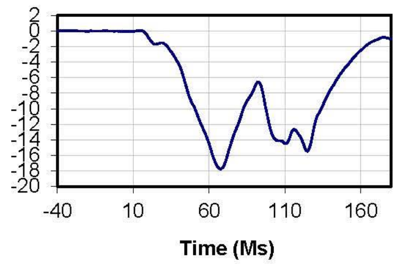

RIGHT SHOULDER X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-40
10
60
110
160
Time (Ms)


RIGHT SHOULDER RESULTANT (LB)
1800
1600
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)

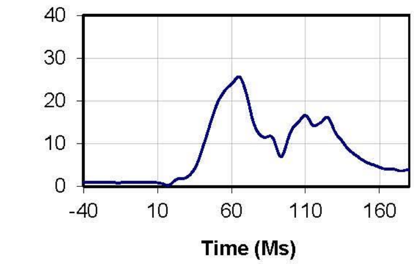

RIGHT SHOULDER Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)


RIGHT SHOULDER Z FORCE (LB)
350
300
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

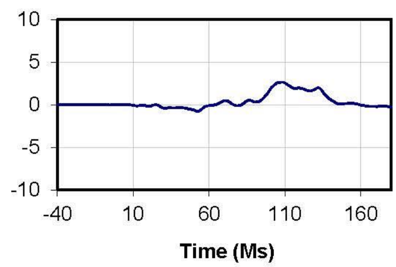
**INT HEAD X ACCEL (G)**



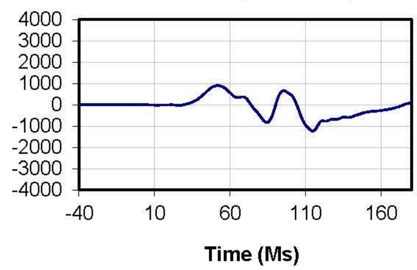

**INT HEAD RESULTANT (G)**



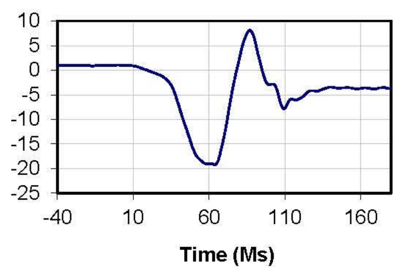

**INT HEAD Y ACCEL (G)**



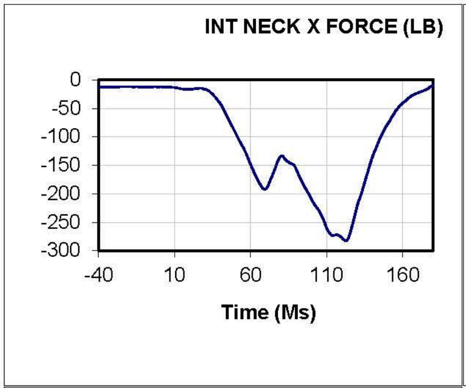

**INT HEAD Ry ANG ACCEL (RAD/SEC2)**

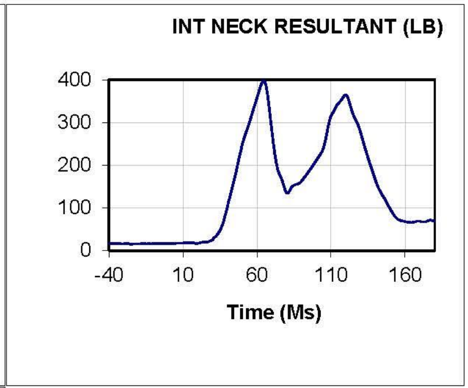


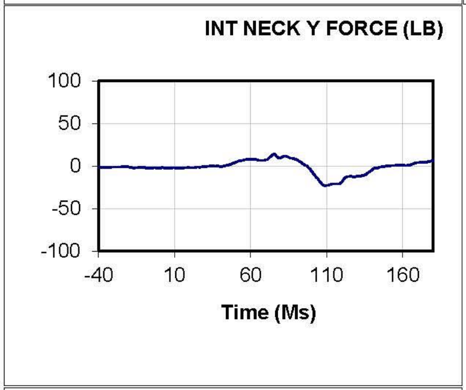

**INT HEAD Z ACCEL (G)**

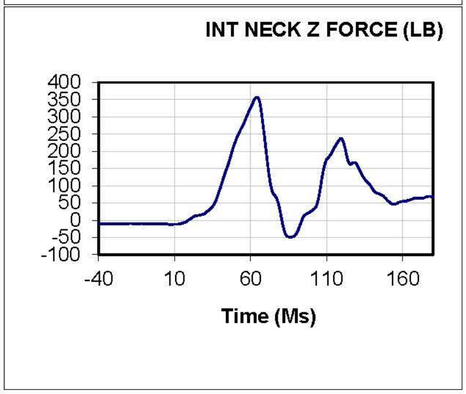


201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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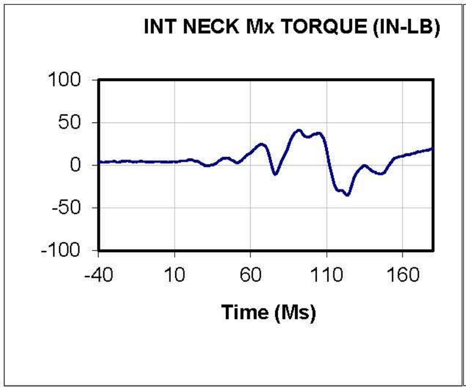
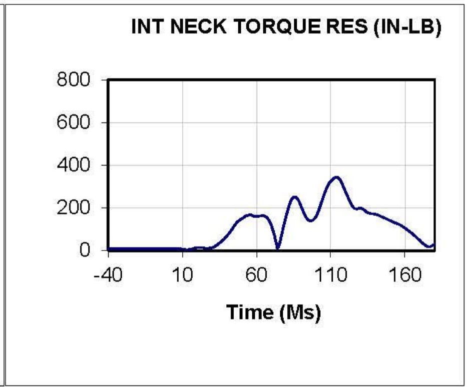
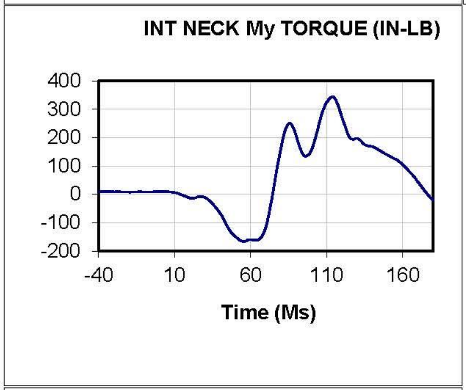
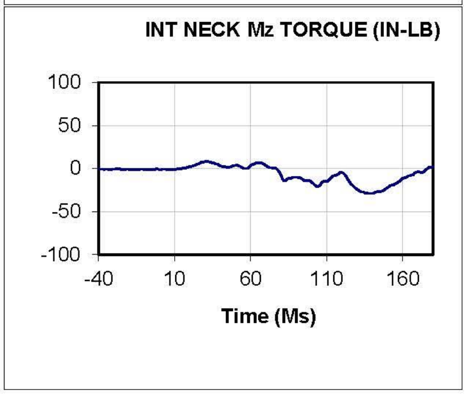
201502  Test: 9011  Test Date: 150309  Subj: LARD  Cell: Q15

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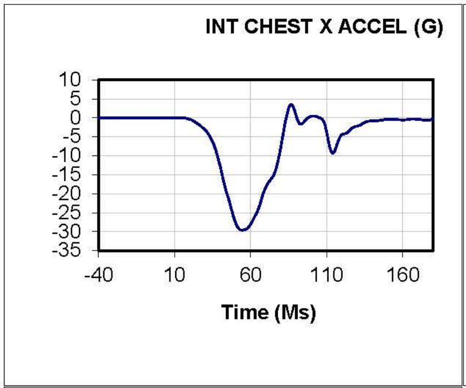
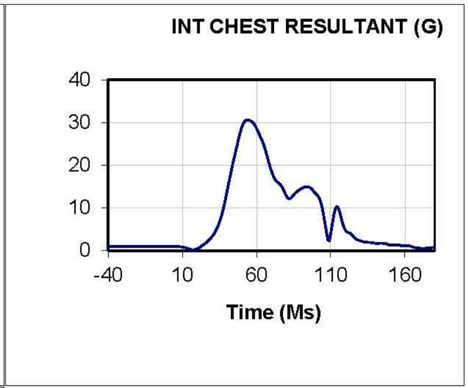
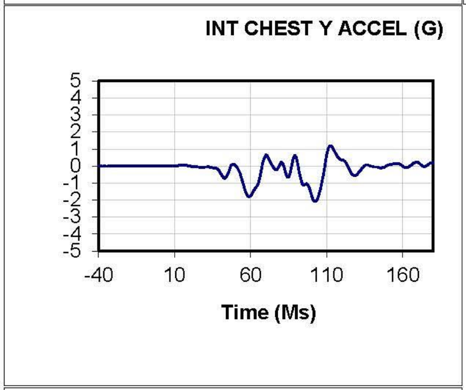
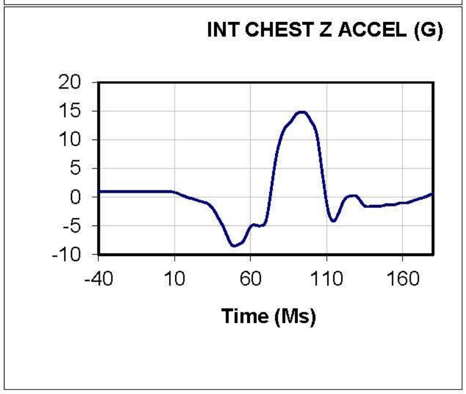
201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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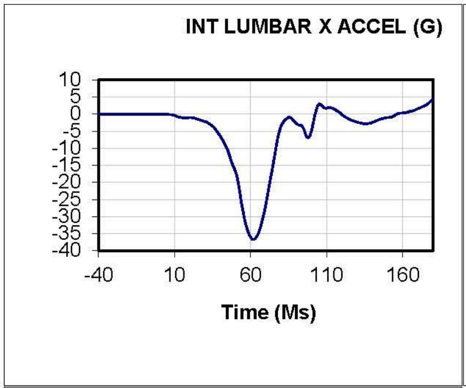
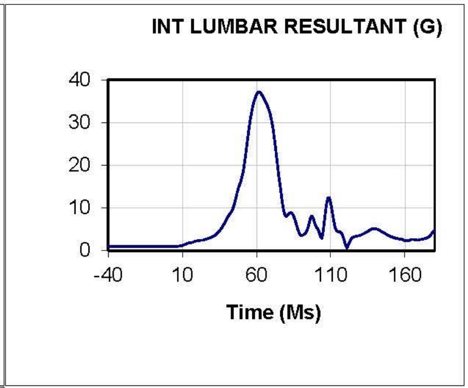
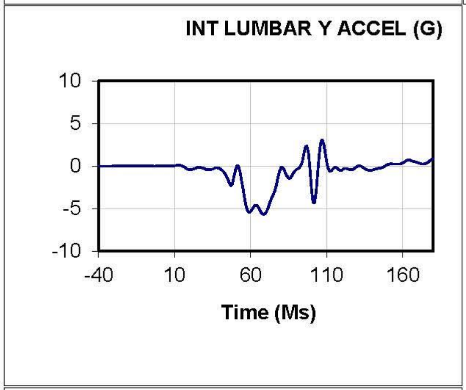
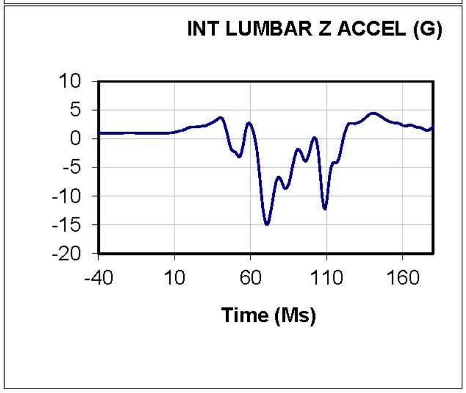
201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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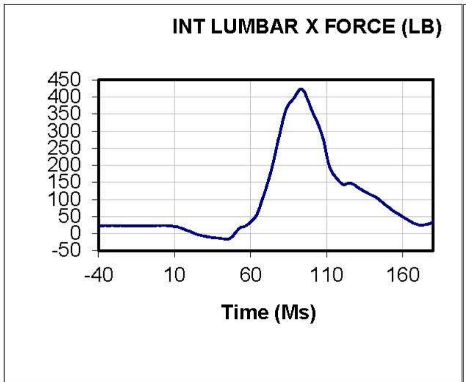
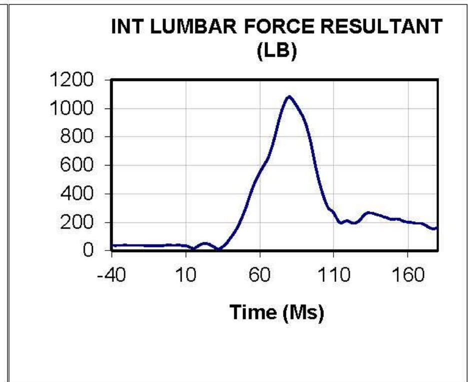
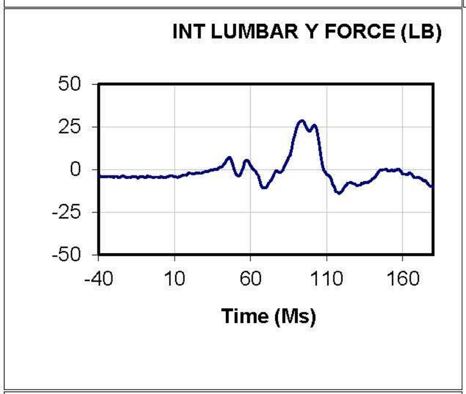
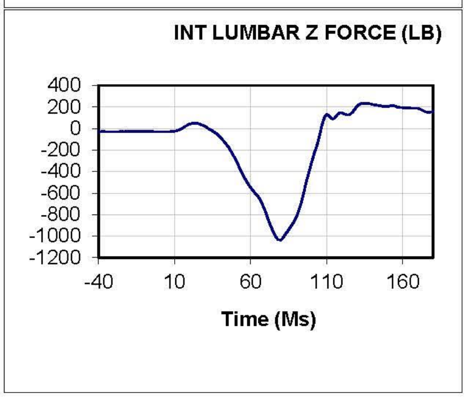
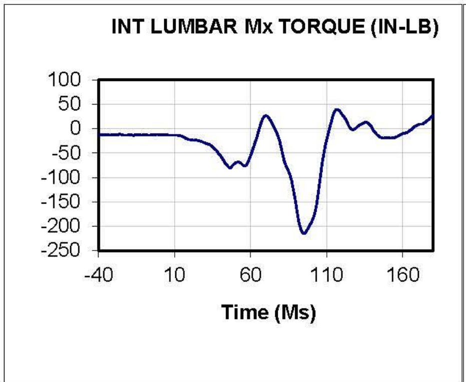

INT LUMBAR X FORCE (LB)
450
400
350
300
250
200
150
100
50
0
-50
-40
10
60
110
160
Time (Ms)

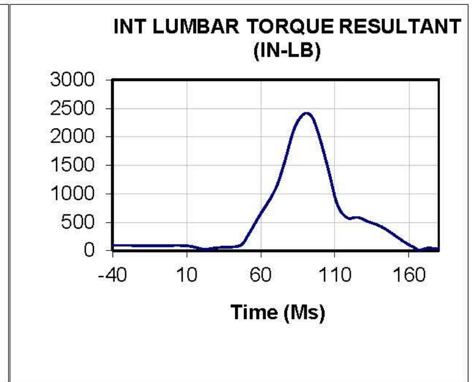

INT LUMBAR FORCE RESULTANT (LB)
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)

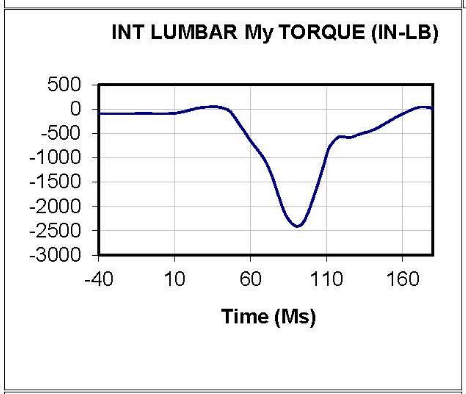

INT LUMBAR Y FORCE (LB)
50
25
0
-25
-50
-40
10
60
110
160
Time (Ms)

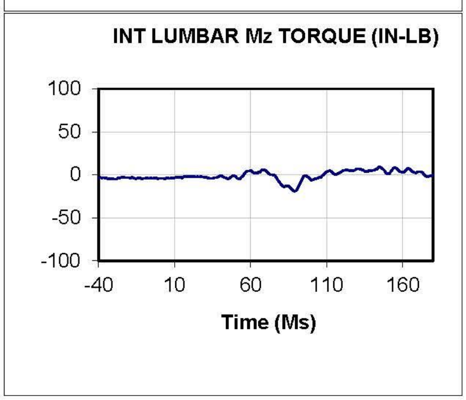

INT LUMBAR Z FORCE (LB)
400
200
0
-200
-400
-600
-800
-1000
-1200
-40
10
60
110
160
Time (Ms)

201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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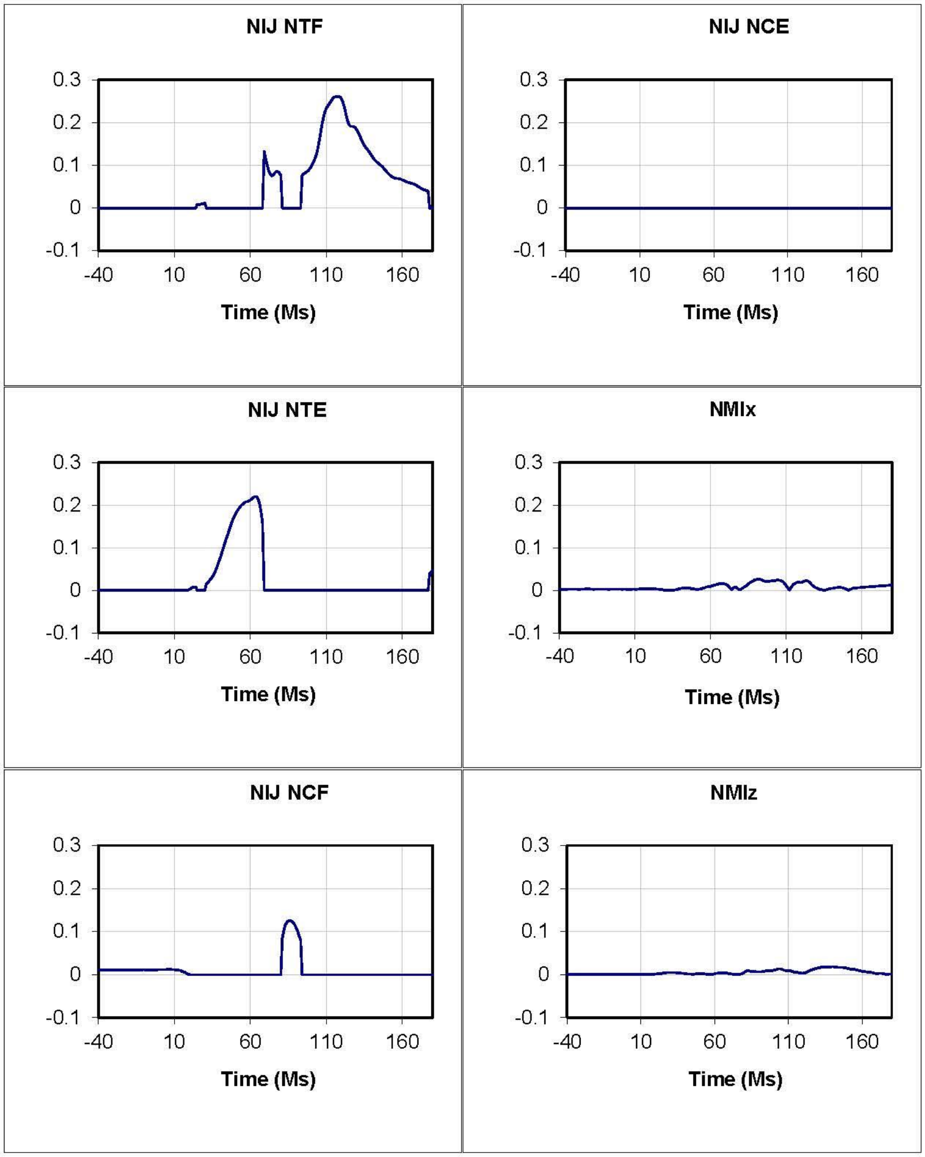
201502 Test: 9011 Test Date: 150309 Subj: LARD Cell: Q15

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201404 Test: 8853 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: S15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 7.0 | |
| Impact Rise Time (Ms) | | | | 46.0 | |
| Impact Duration (Ms) | | | | 108.0 | |
| Velocity Change (Ft/Sec) | | 30.58 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.04 | 15.06 | -0.49 | 46.0 | 118.0 |
| SLED Y ACCEL (G) | 0.00 | 0.40 | -0.84 | 21.0 | 35.0 |
| SLED Z ACCEL (G) | 1.00 | 3.85 | -0.95 | 21.0 | 32.0 |
| SLED VELOCITY (FT/SEC) | 0.16 | 28.54 | 0.21 | 128.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.58 | 0.03 | 108.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.03 | 3.21 | -12.65 | 119.0 | 32.0 |
| SEAT Y ACCEL (G) | 0.01 | 1.09 | -2.22 | 154.0 | 46.0 |
| SEAT Z ACCEL (G) | 0.97 | 2.43 | -12.04 | 125.0 | 39.0 |
| SEAT RESULTANT | 0.97 | 15.54 | 0.60 | 29.0 | 100.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -2.63 | -1.59 | -160.54 | 164.0 | 83.0 |
| LEFT LAP Y FORCE (LB) | 3.21 | 107.33 | 1.28 | 85.0 | 167.0 |
| LEFT LAP Z FORCE (LB) | -27.73 | -2.31 | -590.35 | 167.0 | 84.0 |
| LEFT LAP RESULTANT (LB) | 28.04 | 621.07 | 3.60 | 84.0 | 167.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -2.74 | -1.50 | -191.77 | 155.0 | 82.0 |
| RIGHT LAP Y FORCE (LB) | 3.21 | 8.63 | -37.87 | 41.0 | 90.0 |
| RIGHT LAP Z FORCE (LB) | -24.50 | -3.38 | -742.03 | 165.0 | 83.0 |
| RIGHT LAP RESULTANT (LB) | 24.87 | 767.14 | 4.41 | 83.0 | 165.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -20.52 | -3.77 | -730.66 | 167.0 | 83.0 |
| LEFT SHOULDER Y FORCE (LB) | 2.59 | 11.01 | -0.57 | 42.0 | 77.0 |
| LEFT SHOULDER Z FORCE (LB) | 0.61 | 173.66 | 0.57 | 78.0 | 1.0 |
| LEFT SHOULDER RESULTANT (LB) | 20.70 | 749.22 | 5.08 | 83.0 | 167.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -21.71 | -7.46 | -760.60 | 164.0 | 83.0 |
| RIGHT SHOULDER Y FORCE (LB) | -0.60 | 3.05 | -5.37 | 35.0 | 97.0 |
| RIGHT SHOULDER Z FORCE (LB) | -2.13 | 144.59 | -2.22 | 77.0 | 2.0 |
| RIGHT SHOULDER RESULTANT (LE | 21.82 | 772.98 | 7.62 | 83.0 | 165.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | 0.00 | 3.28 | -24.66 | 53.0 | 107.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 1.52 | -1.48 | 64.0 | 89.0 |
| INT HEAD Z ACCEL (G) | 1.00 | 18.11 | -19.54 | 51.0 | 89.0 |
| INT HEAD RESULTANT (G) | 1.00 | 29.19 | 1.02 | 89.0 | 1.0 |
| INT HEAD HIC | | 100.74 | | 83.0 | 113.0 |
| INT HEAD Ry ANG (RAD/SEC2) | -1.95 | 1929.18 | -1885.87 | 75.0 | 96.0 |

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201404 Test: 8853 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: S15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | 2.11 | 11.66 | -342.95 | 53.0 | 113.0 |
| INT NECK Y FORCE (LB) | -2.35 | 1.17 | -20.49 | 35.0 | 66.0 |
| INT NECK Z FORCE (LB) | -3.01 | 254.10 | -199.14 | 95.0 | 52.0 |
| INT NECK RESULTANT (LB) | 4.40 | 366.46 | 4.31 | 111.0 | 1.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 3.52 | 43.98 | -23.58 | 101.0 | 131.0 |
| INT NECK My TORQUE (IN-LB) | -3.37 | 335.54 | -184.45 | 97.0 | 75.0 |
| INT NECK Mz TORQUE (IN-LB) | -3.59 | 14.43 | -18.08 | 89.0 | 127.0 |
| INT NECK TORQUE RES (IN-LB) | 6.07 | 336.91 | 3.88 | 97.0 | 160.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | -0.01 | 1.53 | -18.57 | 120.0 | 75.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 0.17 | -1.83 | 12.0 | 82.0 |
| INT CHEST Z ACCEL (G) | 1.02 | 18.04 | -2.77 | 50.0 | 98.0 |
| INT CHEST RESULTANT (G) | 1.02 | 22.64 | 0.82 | 64.0 | 116.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.01 | 3.16 | -11.01 | 167.0 | 62.0 |
| INT LUMBAR Y ACCEL (G) | 0.00 | 3.88 | -0.92 | 76.0 | 103.0 |
| INT LUMBAR Z ACCEL (G) | 1.02 | 23.09 | -1.50 | 62.0 | 109.0 |
| INT LUMBAR RESULTANT (G) | 1.02 | 25.61 | 0.82 | 62.0 | 152.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | 3.53 | 3.34 | -285.47 | 3.0 | 64.0 |
| INT LUMBAR Y FORCE (LB) | -6.64 | 23.51 | -29.19 | 106.0 | 74.0 |
| INT LUMBAR Z FORCE (LB) | -24.40 | 148.65 | -1733.34 | 136.0 | 55.0 |
| INT LUMBAR FORCE RESULTANT ( | 25.54 | 1745.12 | 22.57 | 56.0 | 12.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 3.08 | 304.72 | -6.46 | 60.0 | 17.0 |
| INT LUMBAR My TORQUE (IN-LB) | 40.83 | 35.32 | -1640.63 | 0.0 | 68.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -6.84 | 6.09 | -16.09 | 67.0 | 119.0 |
| INT LUMBAR TORQUE RESULTANT | 41.52 | 1658.34 | 6.44 | 68.0 | 22.0 |

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201404 Test: 8853 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: S15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 11.66 | -342.95 | 53.0 | 113.0 |
| NIJ TENSION (LB) | | 254.10 | | 95.0 | |
| NIJ COMPRESSION (LB) | | -199.14 | | 52.0 | |
| NIJ FLEXION (IN-LB) | | 513.68 | | 111.0 | |
| NIJ EXTENSION (IN-LB) | | 121.54 | | 74.0 | |
| NIJ NTF | 0.0000 | 0.2694 | 0.0000 | 97.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.0895 | 0.0000 | 75.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.1209 | 0.0000 | 52.0 | 0.0 |
| NIJ NCE | 0.0049 | 0.1510 | 0.0000 | 65.0 | 16.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.15 | | | |
| NIJ NTF AIS >= 3 | | 0.06 | | | |
| NIJ NTF AIS >= 4 | | 0.09 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.12 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.07 | | | |
| NIJ NTE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.13 | | | |
| NIJ NCF AIS >= 3 | | 0.05 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.13 | | | |
| NIJ NCE AIS >= 3 | | 0.05 | | | |
| NIJ NCE AIS >= 4 | | 0.07 | | | |
| NIJ NCE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| MNIx | 0.0022 | 0.0278 | 0.0001 | 101.0 | 155.0 |
| NMIz | 0.0023 | 0.0114 | 0.0000 | 127.0 | 156.0 |

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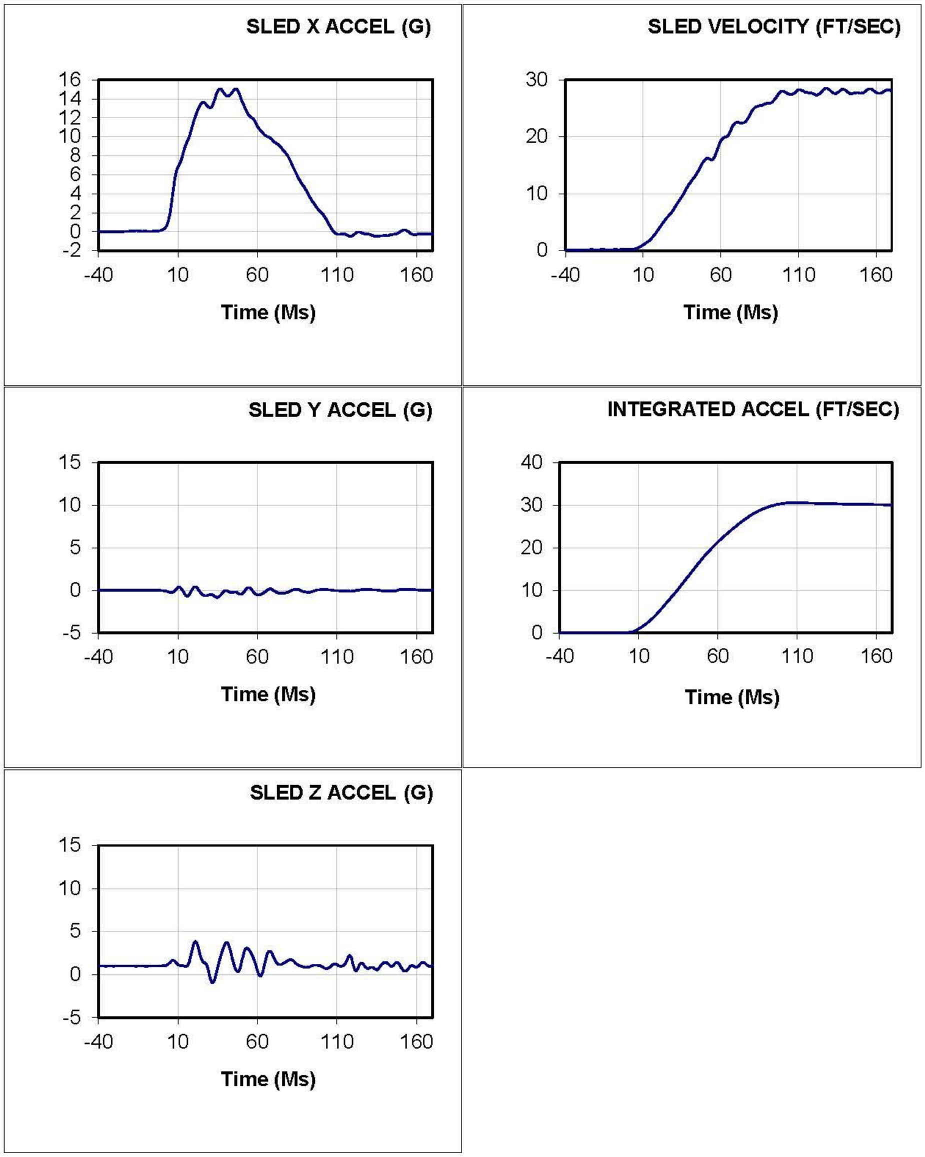
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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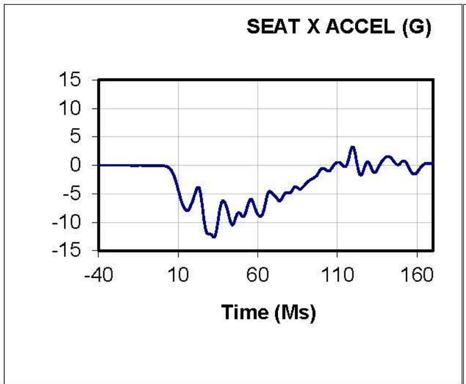
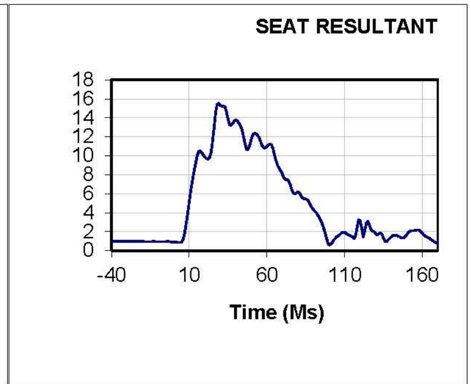
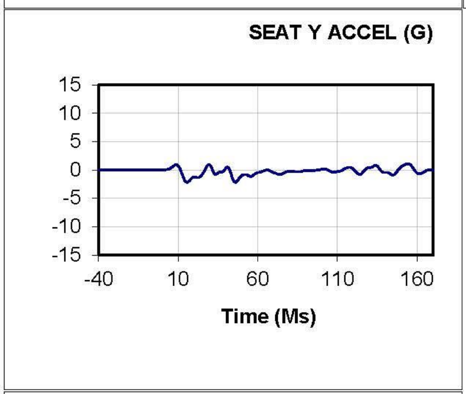
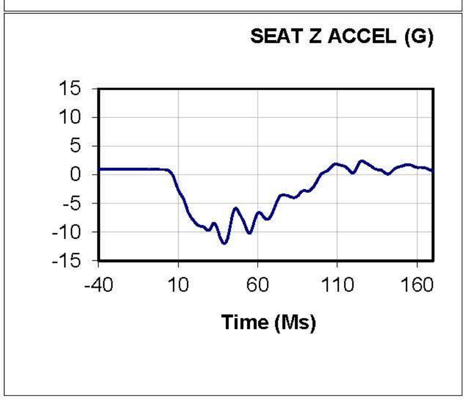
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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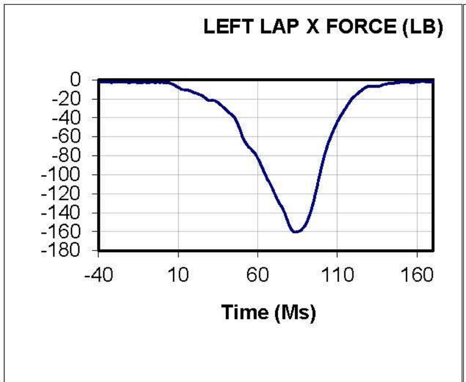
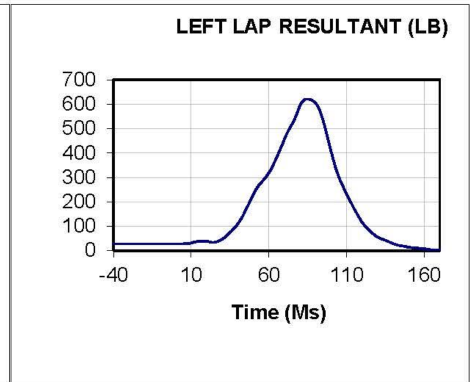
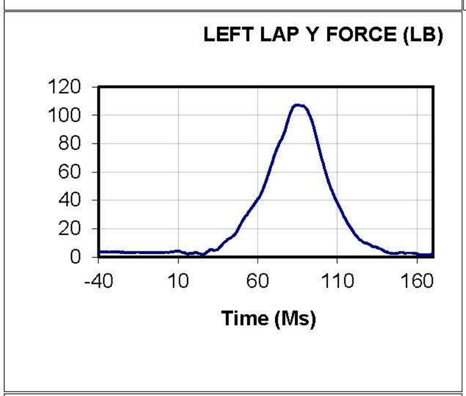
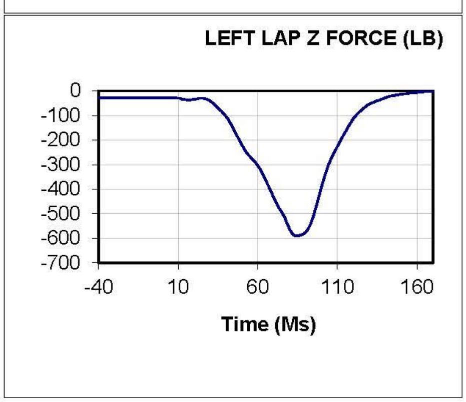
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

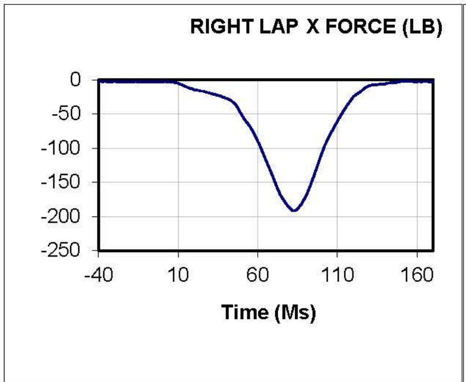


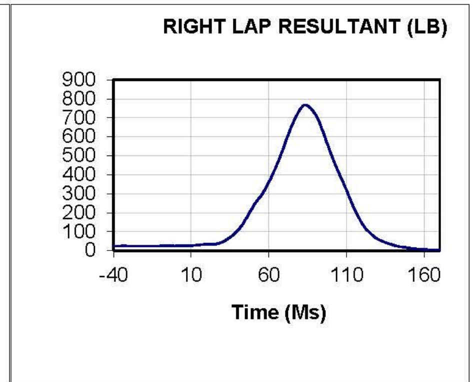



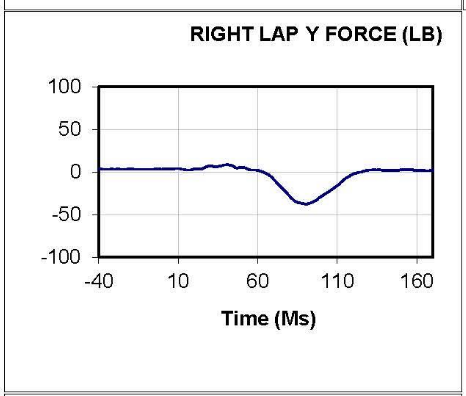



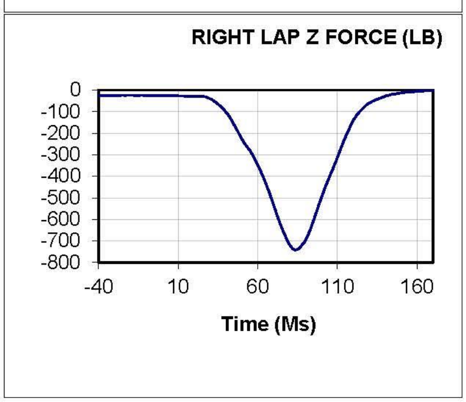



201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

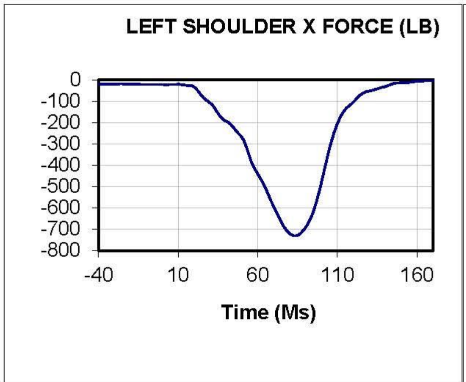


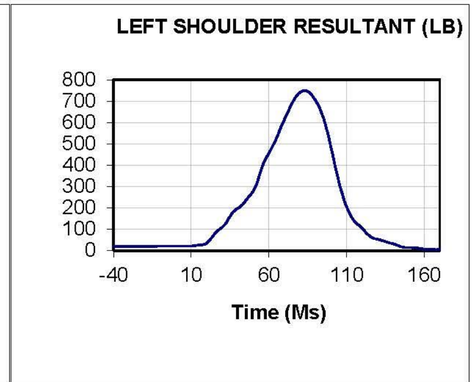



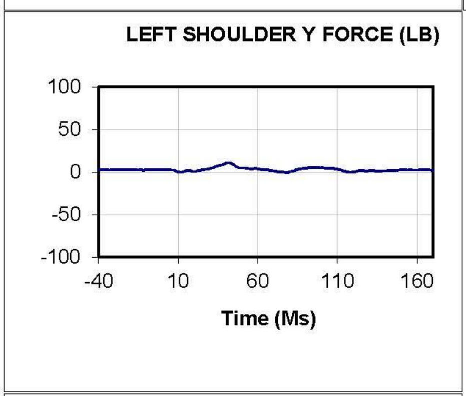



201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15





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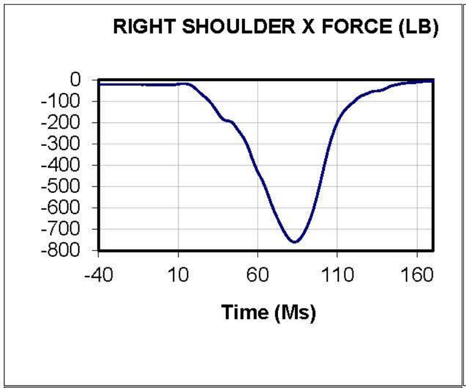
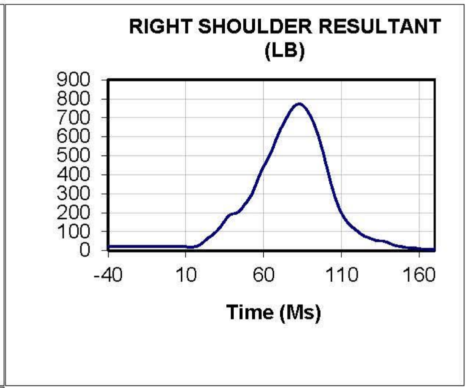
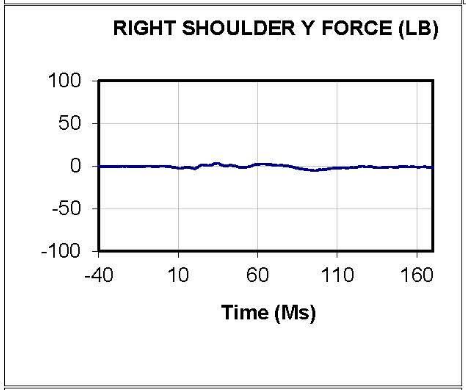
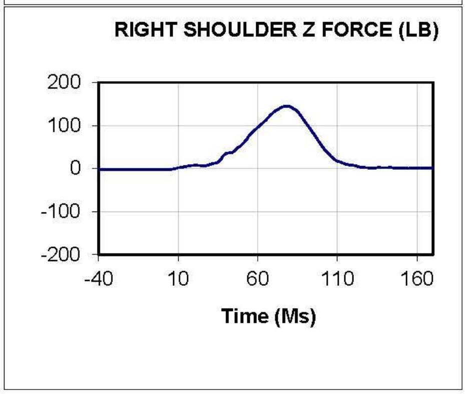
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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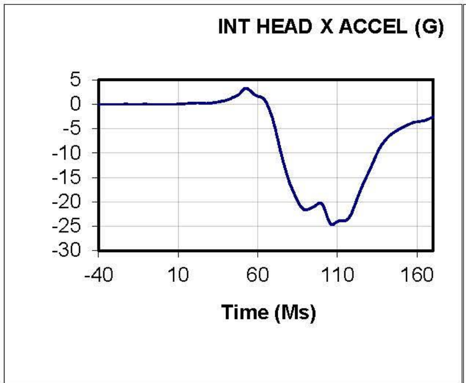
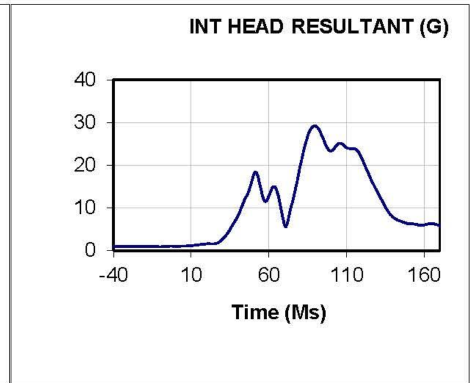
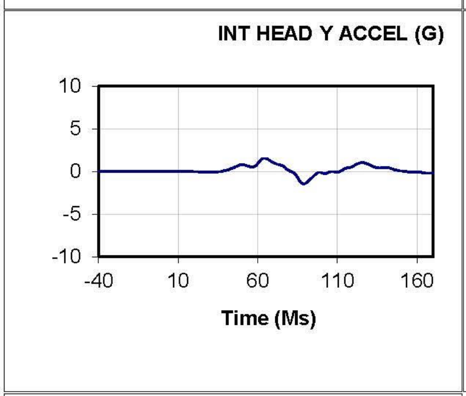
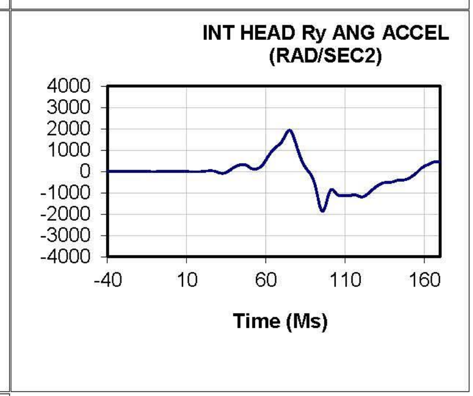
DISTRIBUTION STATEMENT A. Approved for public release. Cleared, 88PA, Case #2017-6051.

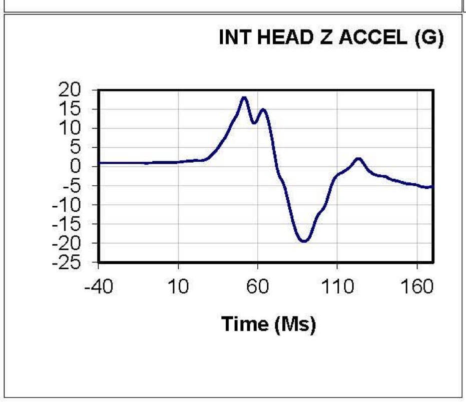
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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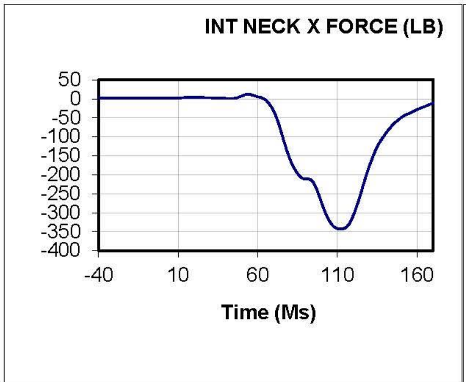
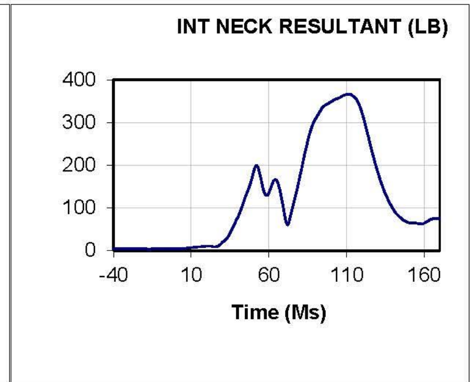
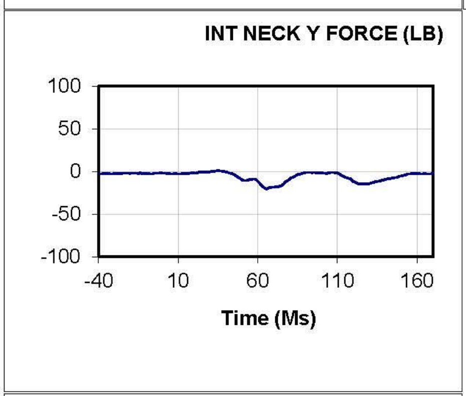
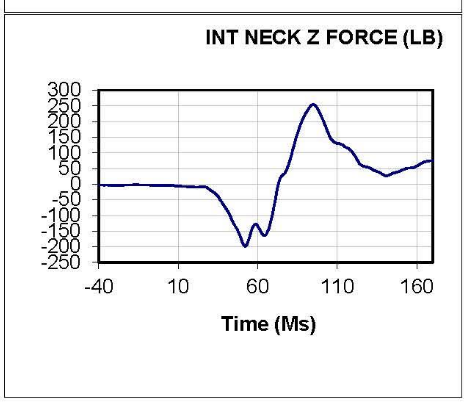
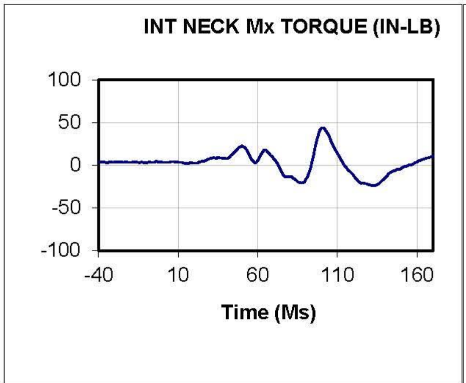
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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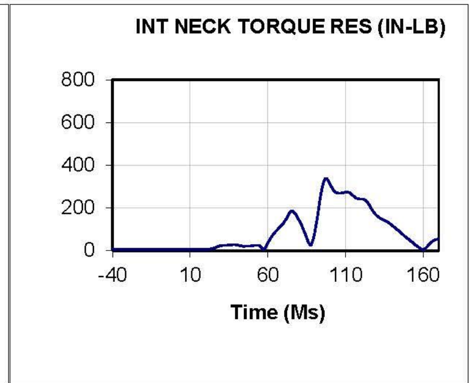
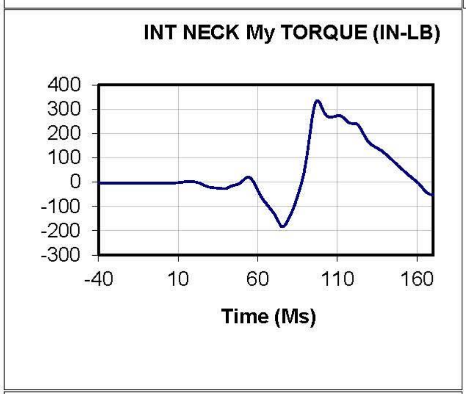
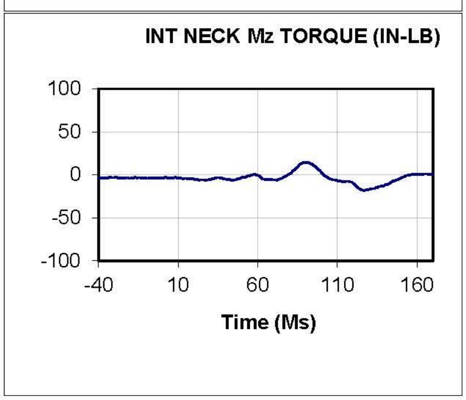
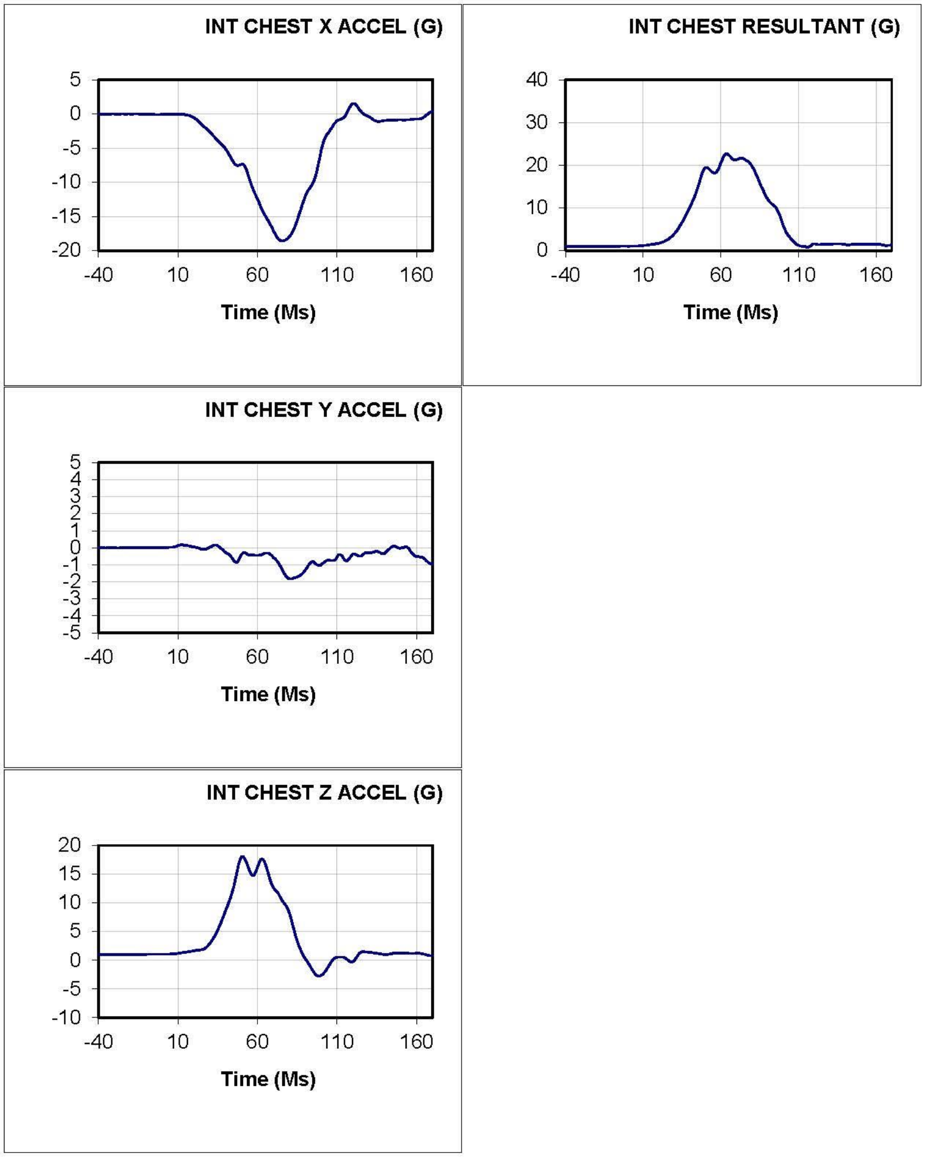
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)


INT NECK TORQUE RES (IN-LB)
800
600
400
200
0
-40
10
60
110
160
Time (Ms)


INT NECK My TORQUE (IN-LB)
400
300
200
100
0
-100
-200
-300
-40
10
60
110
160
Time (Ms)


INT NECK Mz TORQUE (IN-LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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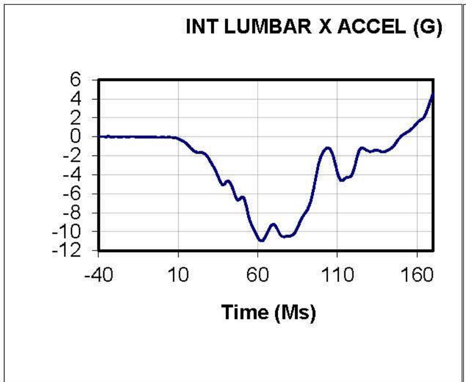
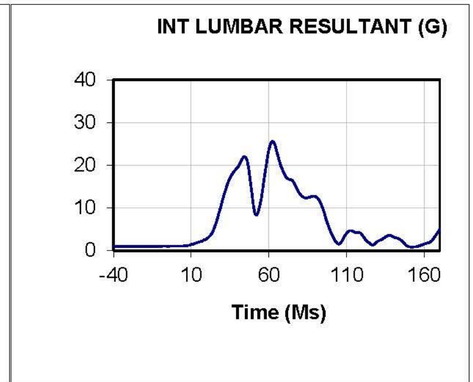
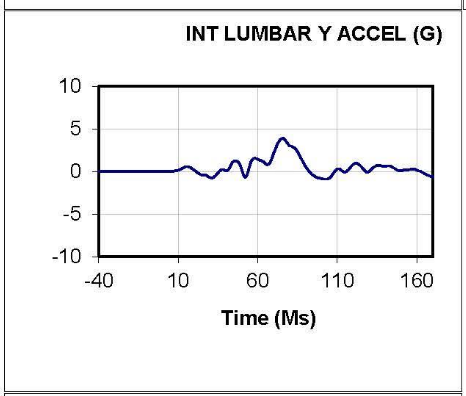
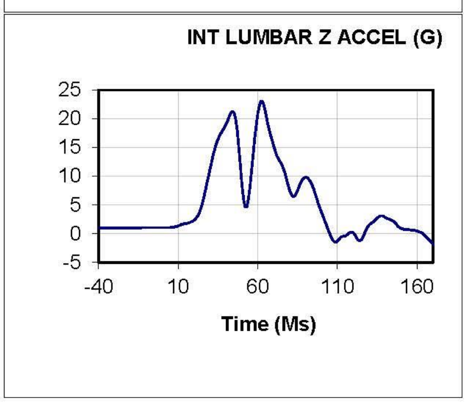
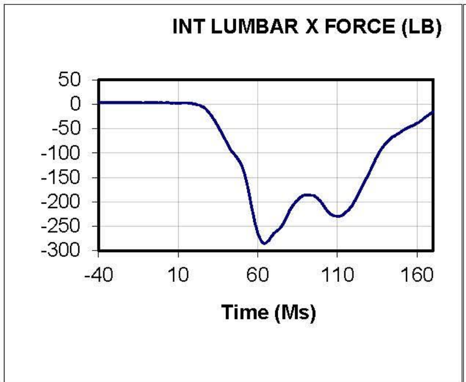

INT LUMBAR X ACCEL (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-40
10
60
110
160
Time (Ms)

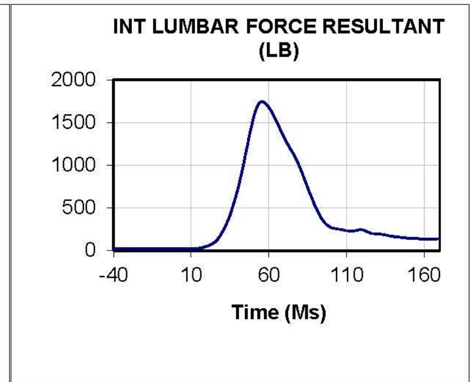

INT LUMBAR RESULTANT (G)
40
30
20
10
0
-40
10
60
110
160
Time (Ms)

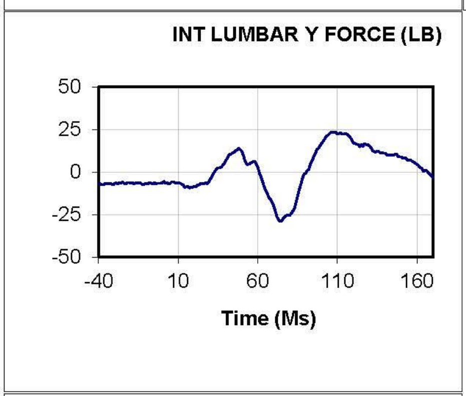

INT LUMBAR Y ACCEL (G)
10
5
0
-5
-10
-40
10
60
110
160
Time (Ms)

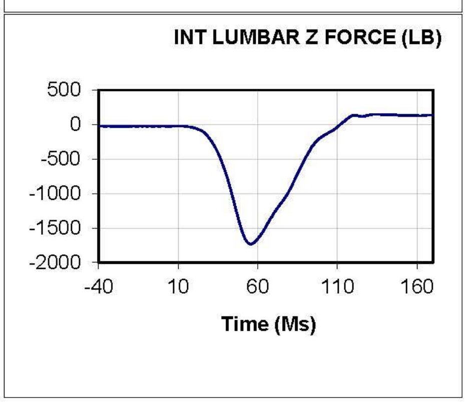

INT LUMBAR Z ACCEL (G)
25
20
15
10
5
0
-5
-40
10
60
110
160
Time (Ms)

201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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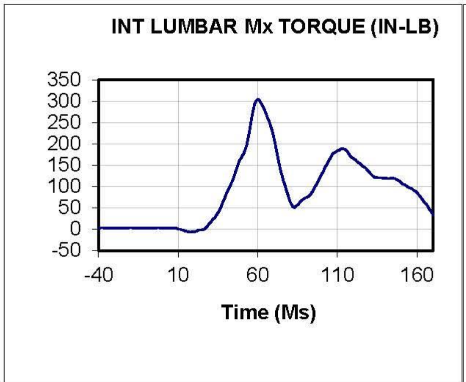
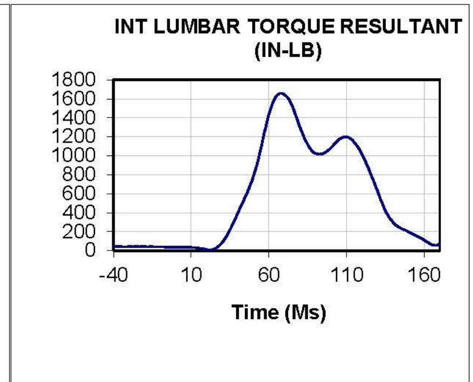
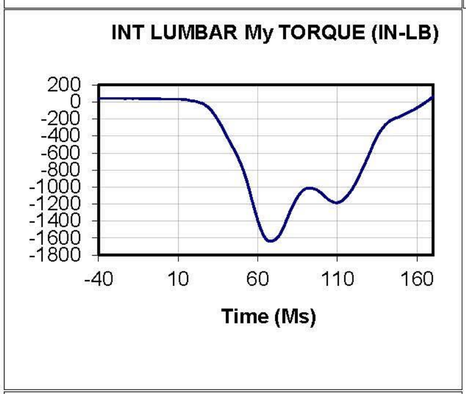
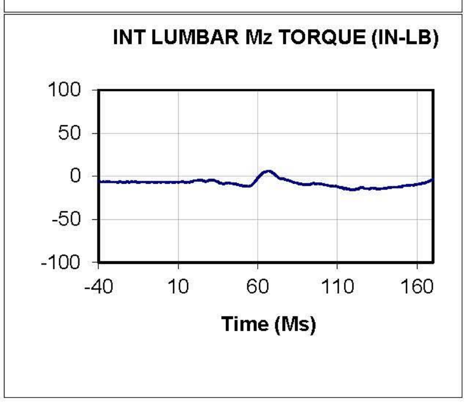
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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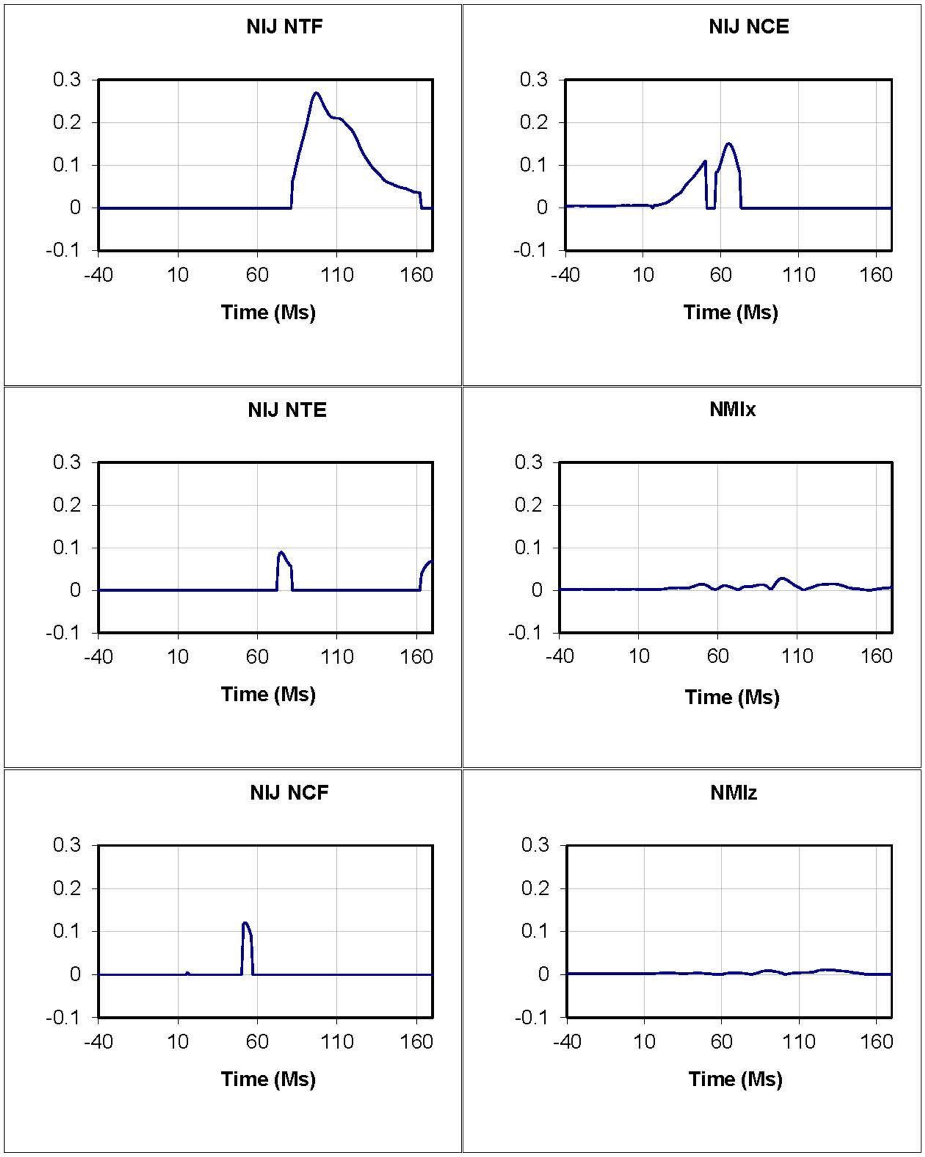
201404 Test: 8853 Test Date: 140815 Subj: LARD Cell: S15

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201404 Test: 8854 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: T15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 8.0 | |
| Impact Rise Time (Ms) | | | | 47.0 | |
| Impact Duration (Ms) | | | | 108.0 | |
| Velocity Change (Ft/Sec) | | 30.40 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.03 | 14.99 | -0.52 | 47.0 | 120.0 |
| SLED Y ACCEL (G) | 0.00 | 0.45 | -0.77 | 11.0 | 16.0 |
| SLED Z ACCEL (G) | 1.00 | 3.91 | -0.99 | 41.0 | 32.0 |
| SLED VELOCITY (FT/SEC) | 0.16 | 28.36 | 0.16 | 127.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.40 | 0.01 | 108.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | -0.02 | 3.44 | -12.60 | 121.0 | 33.0 |
| SEAT Y ACCEL (G) | -0.01 | 0.94 | -2.43 | 9.0 | 16.0 |
| SEAT Z ACCEL (G) | 0.97 | 2.57 | -12.05 | 127.0 | 39.0 |
| SEAT RESULTANT | 0.97 | 15.39 | 0.53 | 29.0 | 101.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -3.00 | -2.20 | -182.56 | 167.0 | 87.0 |
| LEFT LAP Y FORCE (LB) | 2.86 | 105.84 | 1.10 | 89.0 | 17.0 |
| LEFT LAP Z FORCE (LB) | -19.67 | -2.94 | -613.71 | 168.0 | 88.0 |
| LEFT LAP RESULTANT (LB) | 20.10 | 648.77 | 4.41 | 88.0 | 168.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -3.70 | -2.46 | -212.99 | 156.0 | 85.0 |
| RIGHT LAP Y FORCE (LB) | 3.30 | 7.89 | -57.27 | 42.0 | 90.0 |
| RIGHT LAP Z FORCE (LB) | -23.67 | -5.73 | -832.78 | 168.0 | 86.0 |
| RIGHT LAP RESULTANT (LB) | 24.19 | 861.40 | 6.80 | 86.0 | 168.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -16.11 | -4.38 | -887.05 | 168.0 | 89.0 |
| LEFT SHOULDER Y FORCE (LB) | 3.42 | 6.58 | -17.27 | 40.0 | 77.0 |
| LEFT SHOULDER Z FORCE (LB) | 2.51 | 193.40 | 2.66 | 83.0 | 0.0 |
| LEFT SHOULDER RESULTANT (LB) | 16.66 | 905.34 | 6.30 | 89.0 | 168.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -14.62 | -4.33 | -854.46 | 168.0 | 89.0 |
| RIGHT SHOULDER Y FORCE (LB) | -2.50 | -1.22 | -22.62 | 158.0 | 87.0 |
| RIGHT SHOULDER Z FORCE (LB) | 0.48 | 146.39 | 0.37 | 84.0 | 0.0 |
| RIGHT SHOULDER RESULTANT (LE | 14.85 | 865.53 | 5.54 | 89.0 | 168.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | -0.02 | 2.90 | -26.97 | 55.0 | 106.0 |
| INT HEAD Y ACCEL (G) | 0.01 | 0.92 | -2.24 | 65.0 | 89.0 |
| INT HEAD Z ACCEL (G) | 1.02 | 15.90 | -24.83 | 52.0 | 90.0 |
| INT HEAD RESULTANT (G) | 1.02 | 35.09 | 1.02 | 91.0 | 5.0 |
| INT HEAD HIC | | 151.30 | | 83.0 | 113.0 |
| INT HEAD Ry ANG (RAD/SEC2) | -7.42 | 1692.52 | -1397.44 | 73.0 | 96.0 |

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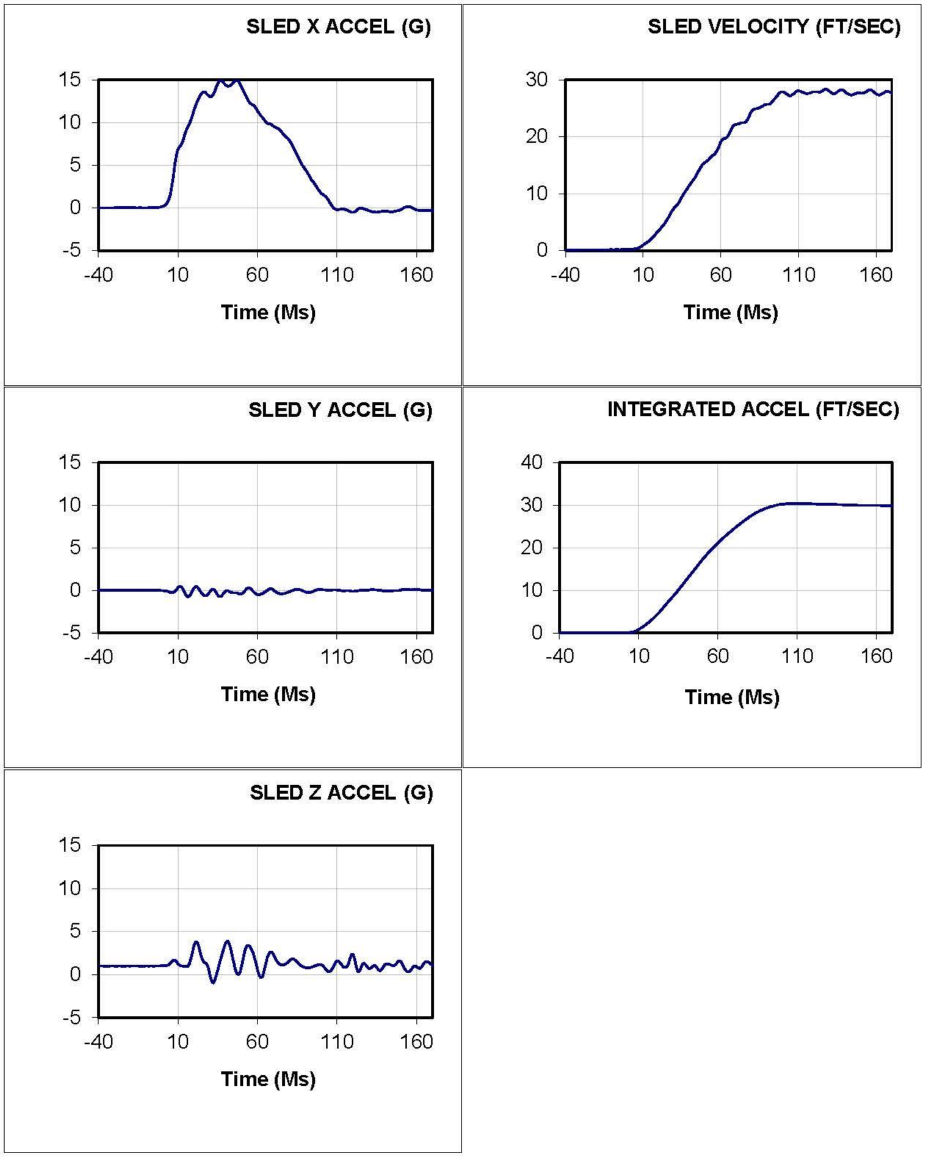
201404 Test: 8854 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: T15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | -1.17 | 32.77 | -371.91 | 58.0 | 110.0 |
| INT NECK Y FORCE (LB) | -1.37 | 24.55 | -12.04 | 108.0 | 65.0 |
| INT NECK Z FORCE (LB) | -5.38 | 336.61 | -175.28 | 96.0 | 53.0 |
| INT NECK RESULTANT (LB) | 5.70 | 428.00 | 1.96 | 99.0 | 18.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 4.90 | 68.24 | -27.36 | 105.0 | 87.0 |
| INT NECK My TORQUE (IN-LB) | -1.46 | 251.47 | -184.06 | 109.0 | 73.0 |
| INT NECK Mz TORQUE (IN-LB) | -4.23 | 15.91 | -7.31 | 94.0 | 71.0 |
| INT NECK TORQUE RES (IN-LB) | 6.66 | 259.20 | 6.27 | 109.0 | 3.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | -0.02 | 0.30 | -19.21 | 125.0 | 80.0 |
| INT CHEST Y ACCEL (G) | 0.01 | 0.20 | -1.01 | 158.0 | 111.0 |
| INT CHEST Z ACCEL (G) | 1.02 | 17.13 | -4.92 | 52.0 | 99.0 |
| INT CHEST RESULTANT (G) | 1.02 | 21.55 | 1.02 | 64.0 | 2.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | -0.02 | 0.60 | -11.11 | 158.0 | 62.0 |
| INT LUMBAR Y ACCEL (G) | -0.01 | 2.66 | -0.89 | 86.0 | 114.0 |
| INT LUMBAR Z ACCEL (G) | 1.03 | 21.18 | -2.68 | 45.0 | 112.0 |
| INT LUMBAR RESULTANT (G) | 1.03 | 23.63 | 0.93 | 62.0 | 155.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | 0.19 | 1.19 | -285.99 | 168.0 | 63.0 |
| INT LUMBAR Y FORCE (LB) | -8.36 | 6.26 | -23.52 | 150.0 | 83.0 |
| INT LUMBAR Z FORCE (LB) | -28.76 | 118.39 | -1630.69 | 121.0 | 56.0 |
| INT LUMBAR FORCE RESULTANT ( | 29.96 | 1644.30 | 28.66 | 56.0 | 5.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | -1.03 | 162.48 | -14.79 | 59.0 | 90.0 |
| INT LUMBAR My TORQUE (IN-LB) | 17.43 | 142.57 | -1600.50 | 168.0 | 66.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -5.04 | 5.36 | -15.12 | 63.0 | 139.0 |
| INT LUMBAR TORQUE RESULTANT | 18.19 | 1605.86 | 4.21 | 66.0 | 20.0 |

201404 Test: 8854 Test Date: 140815 Subj: LARD Wt: 251.0
Nom G: 15.0 Cell: T15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 36.82 | -371.91 | 177.0 | 110.0 |
| NIJ TENSION (LB) | | 336.61 | | 96.0 | |
| NIJ COMPRESSION (LB) | | -175.28 | | 53.0 | |
| NIJ FLEXION (IN-LB) | | 511.41 | | 110.0 | |
| NIJ EXTENSION (IN-LB) | | 138.31 | | 72.0 | |
| NIJ NTF | 0.0000 | 0.2973 | 0.0000 | 97.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.1129 | 0.0000 | 73.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.0205 | 0.0000 | 31.0 | 0.0 |
| NIJ NCE | 0.0036 | 0.1411 | 0.0000 | 64.0 | 3.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.15 | | | |
| NIJ NTF AIS >= 3 | | 0.07 | | | |
| NIJ NTF AIS >= 4 | | 0.09 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.13 | | | |
| NIJ NTE AIS >= 3 | | 0.05 | | | |
| NIJ NTE AIS >= 4 | | 0.07 | | | |
| NIJ NTE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.12 | | | |
| NIJ NCF AIS >= 3 | | 0.04 | | | |
| NIJ NCF AIS >= 4 | | 0.06 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.13 | | | |
| NIJ NCE AIS >= 3 | | 0.05 | | | |
| NIJ NCE AIS >= 4 | | 0.07 | | | |
| NIJ NCE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| MNIx | 0.0031 | 0.0431 | 0.0000 | 105.0 | 25.0 |
| NMIz | 0.0027 | 0.0100 | 0.0000 | 94.0 | 15.0 |

201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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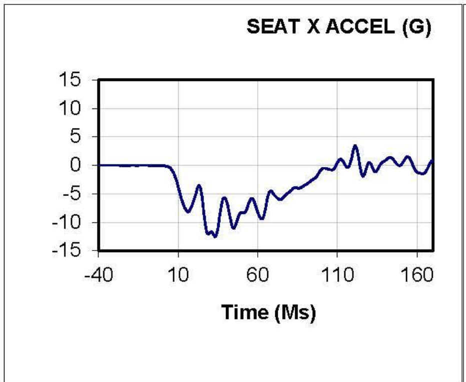
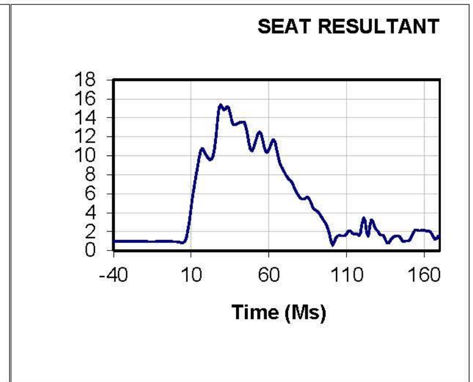
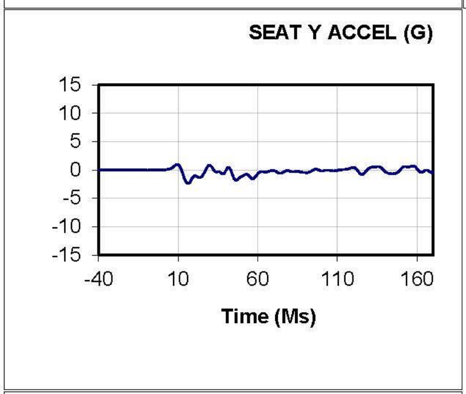
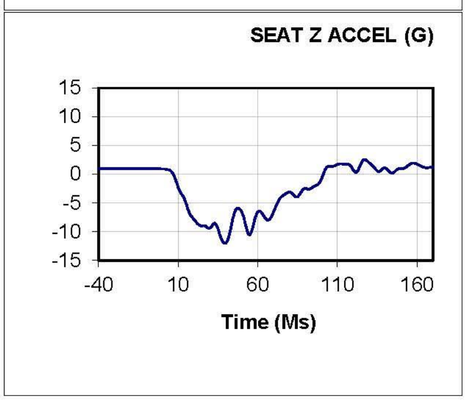
201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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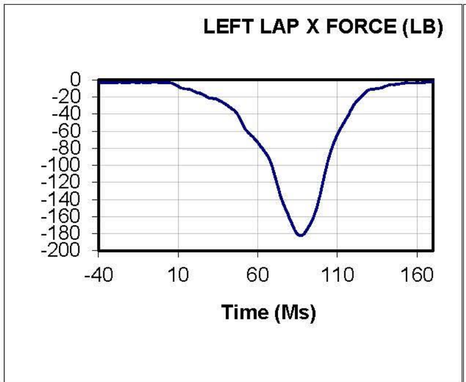
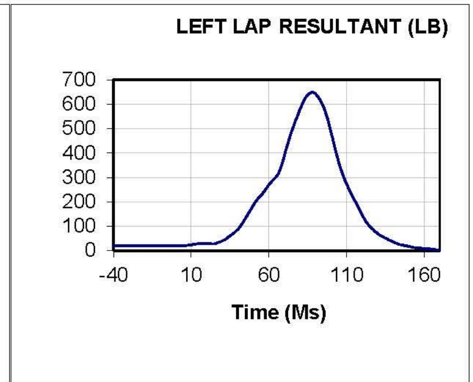
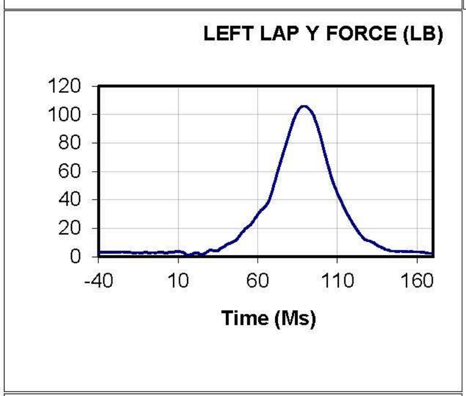
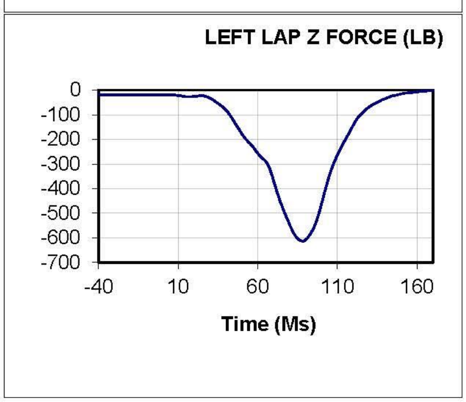
201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

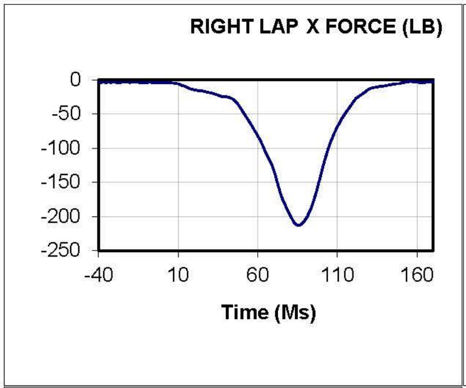


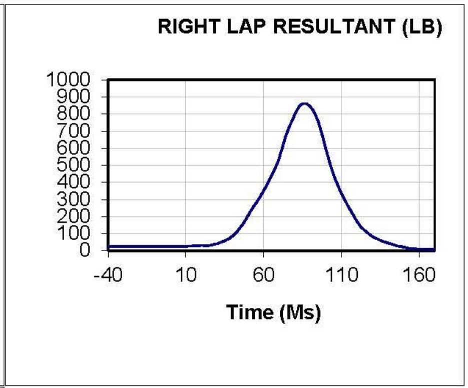



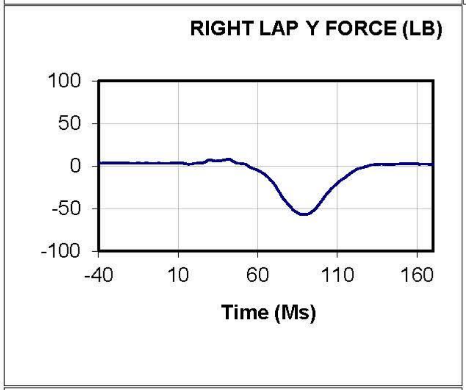



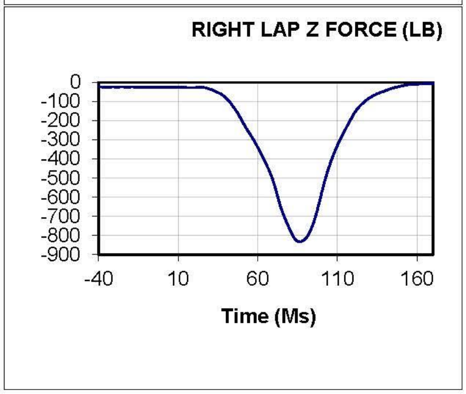



201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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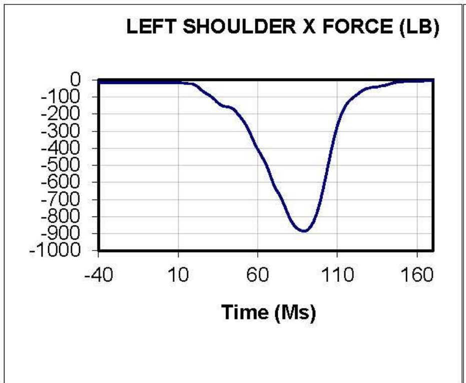
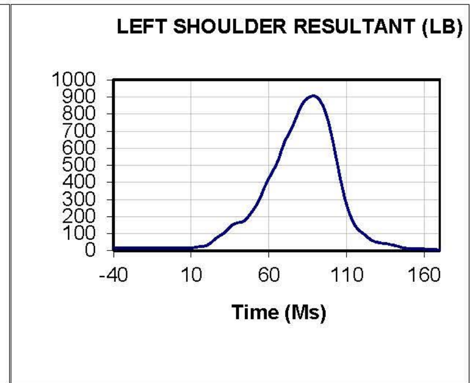
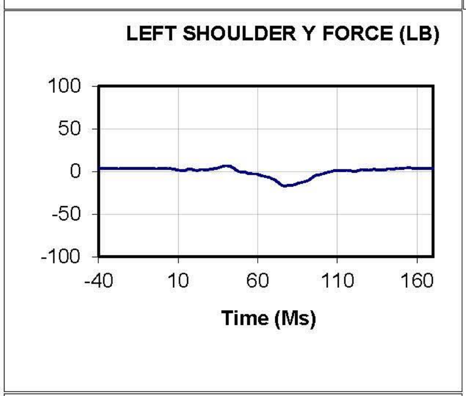
DISTRIBUTION STATEMENT A. Approved for public release. Cleared, 88PA, Case #2017-6051.

201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15





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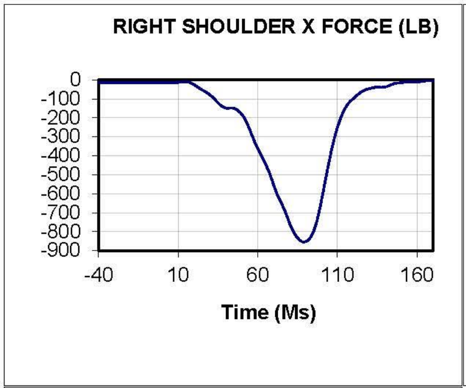
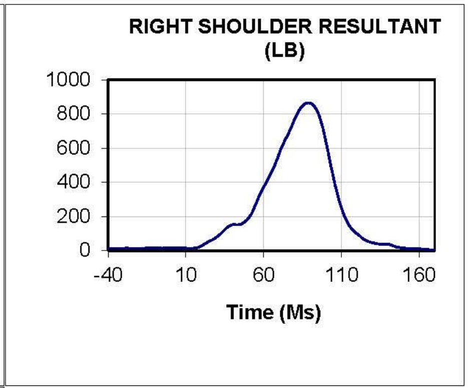
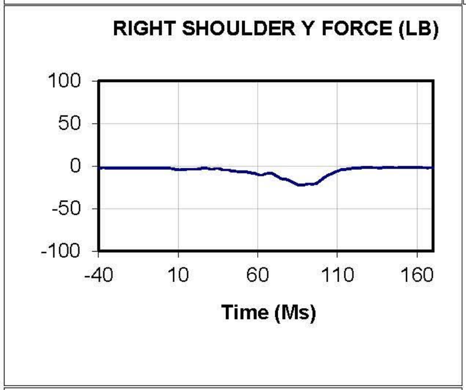
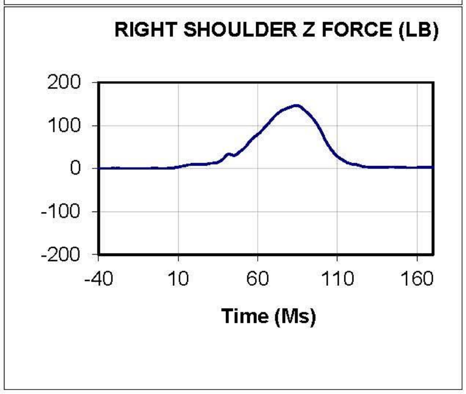
201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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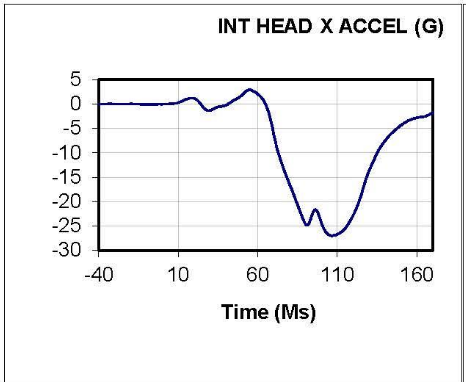
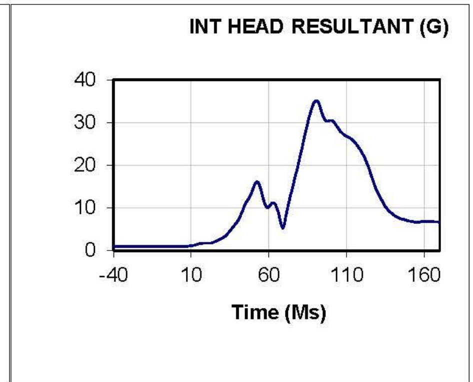
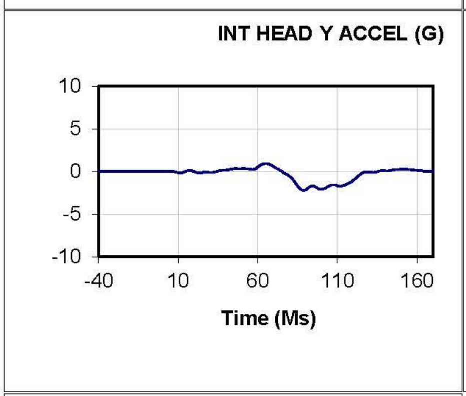
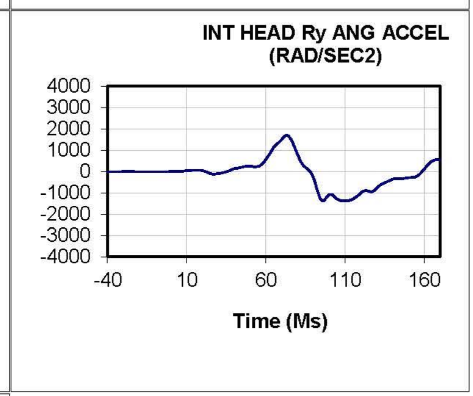
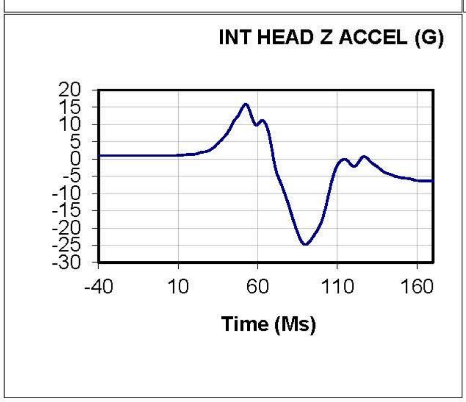
201404  Test: 8854  Test Date: 140815  Subj: LARD  Cell: T15

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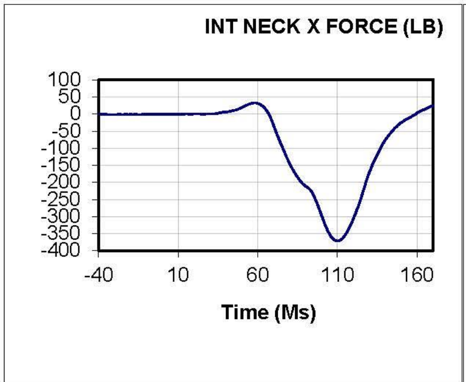
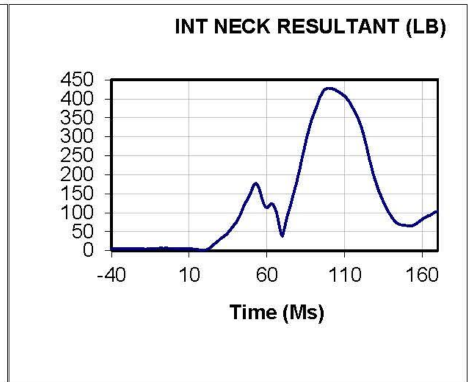
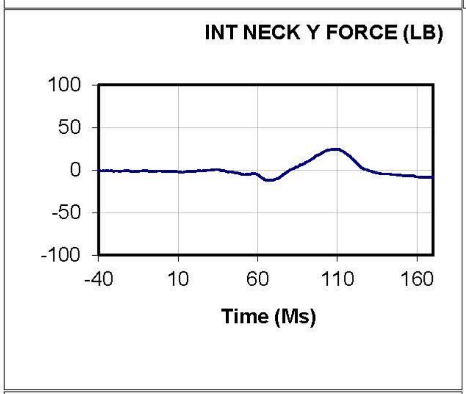
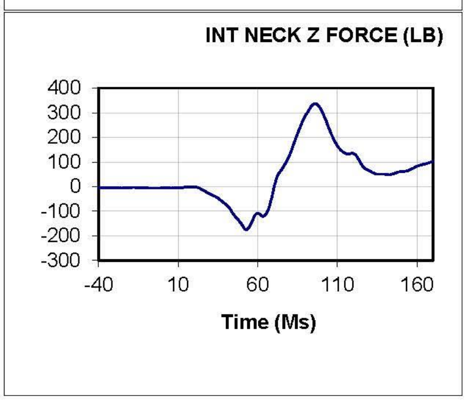
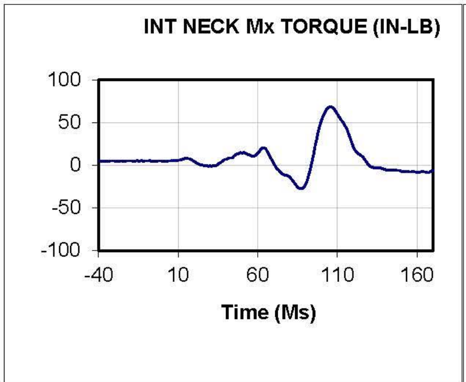

INT NECK X FORCE (LB)
100
50
0
-50
-100
-150
-200
-250
-300
-350
-400
-40
10
60
110
160
Time (Ms)

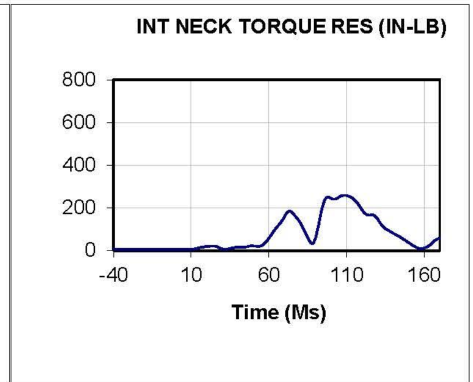

INT NECK RESULTANT (LB)
450
400
350
300
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

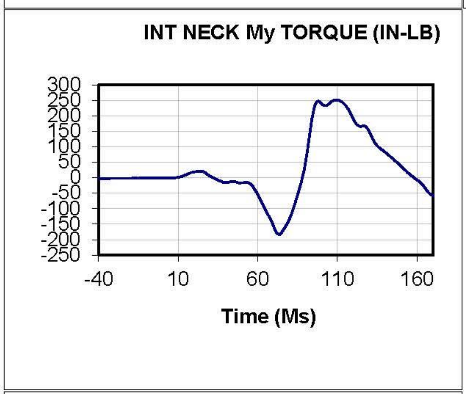

INT NECK Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

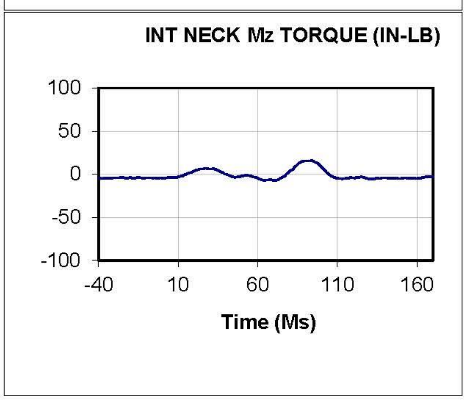

INT NECK Z FORCE (LB)
400
300
200
100
0
-100
-200
-300
-40
10
60
110
160
Time (Ms)

201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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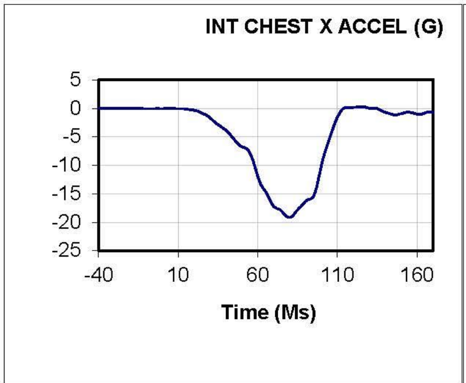
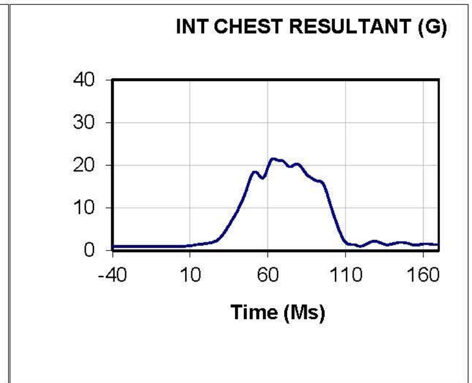
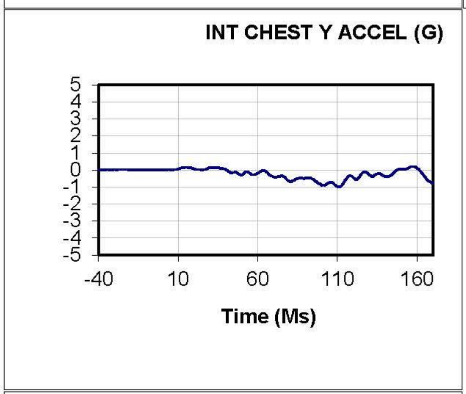
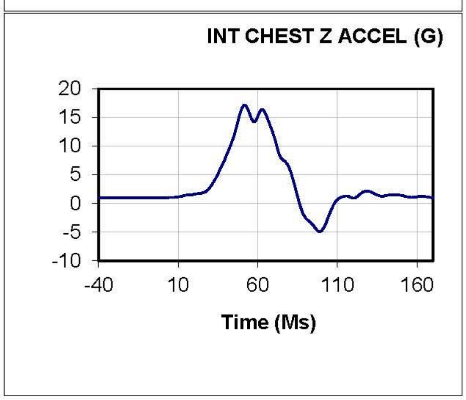
201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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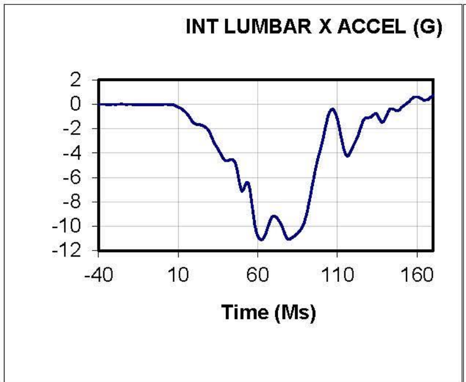
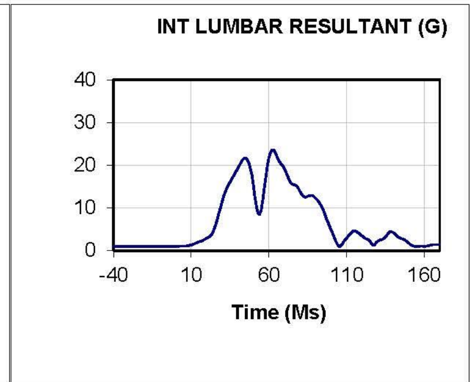
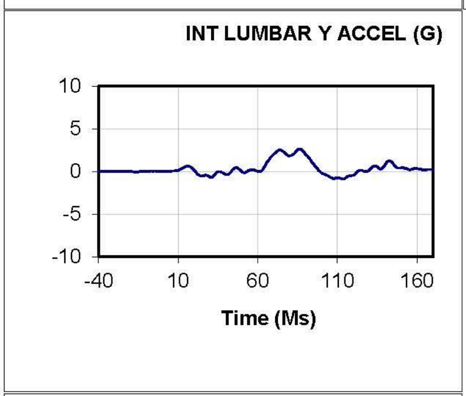
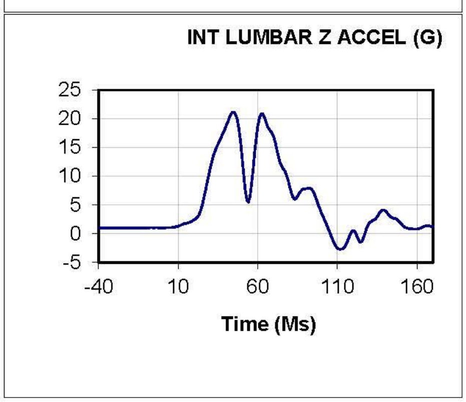
201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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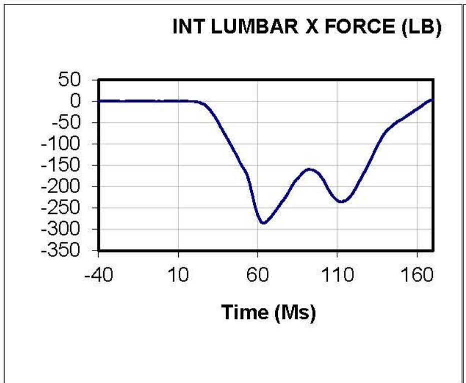
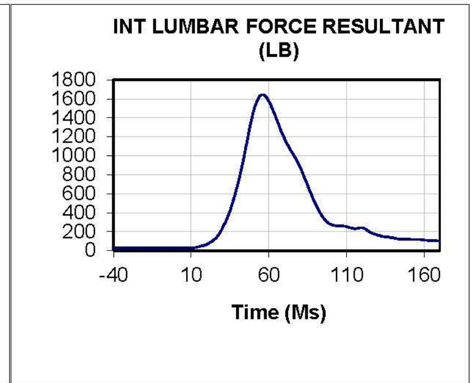
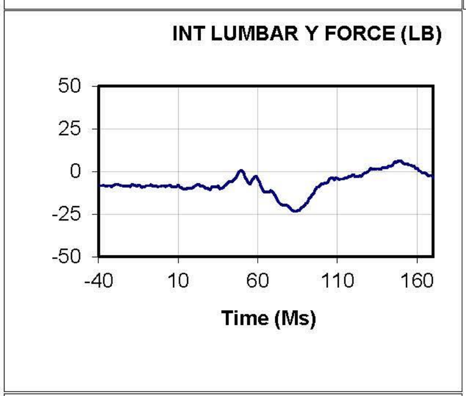
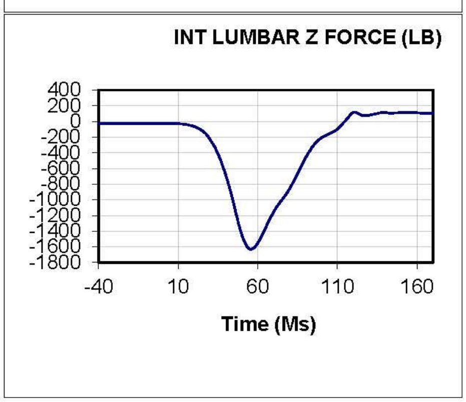
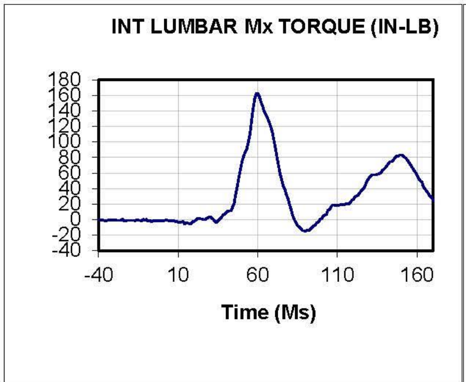
201404  Test: 8854  Test Date: 140815  Subj: LARD  Cell: T15

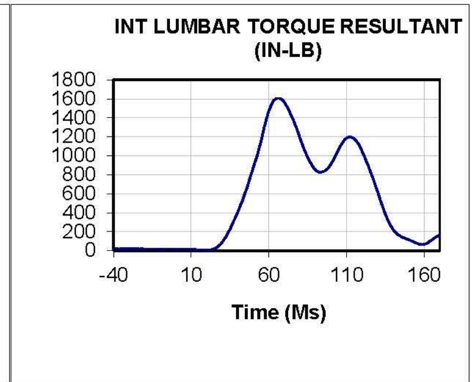


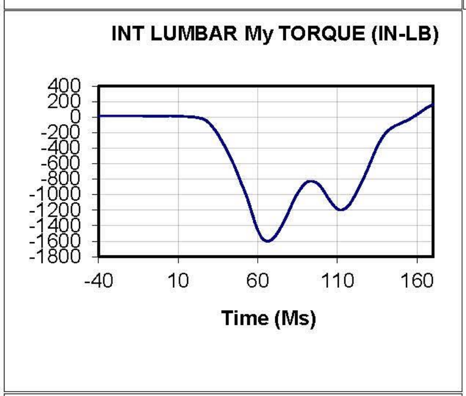



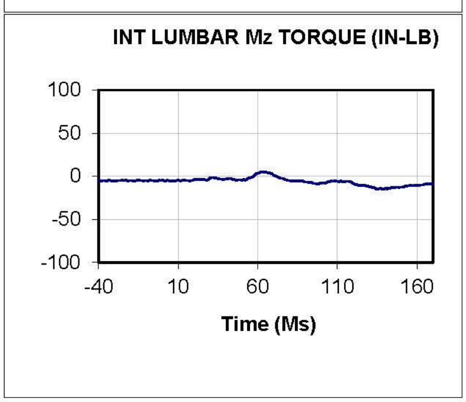



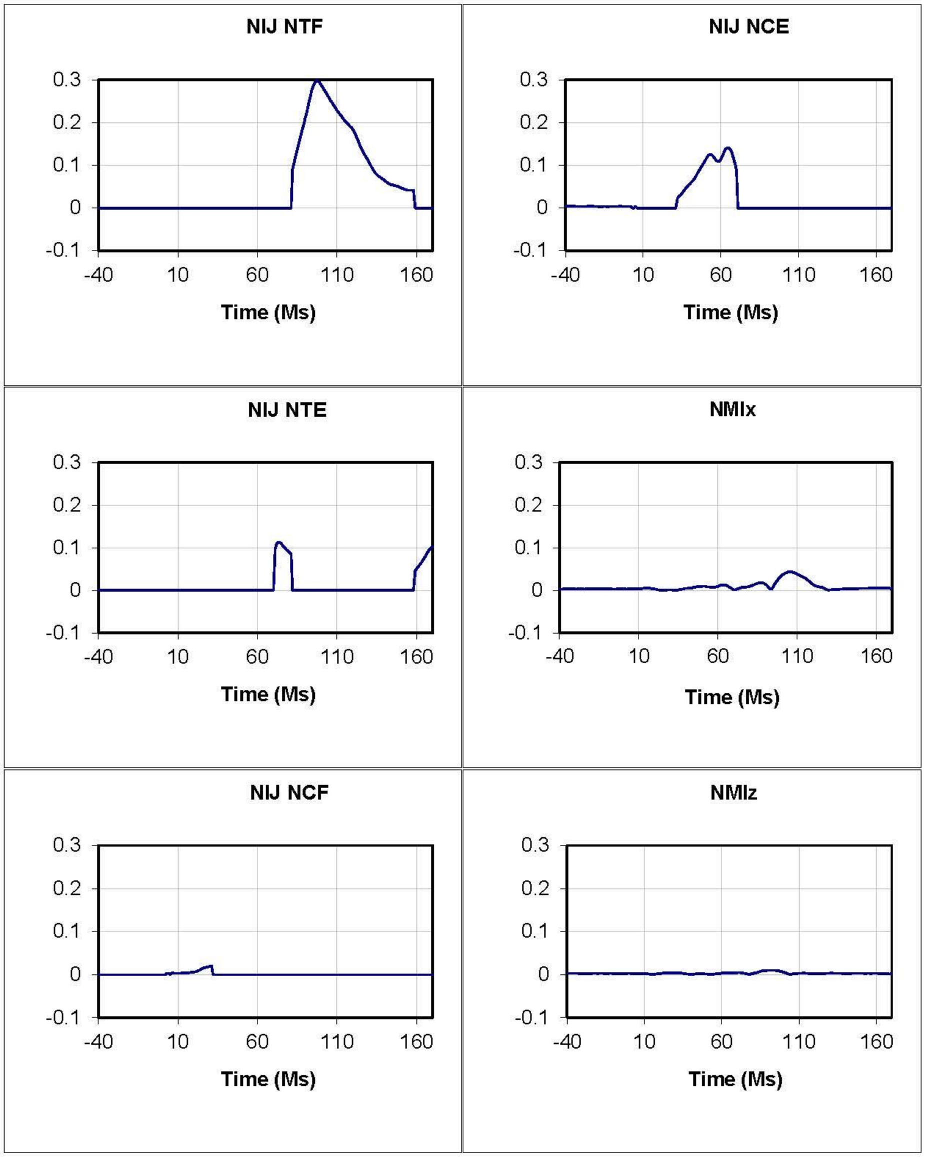

INT LUMBAR Mx TORQUE (IN-LB)
180
160
140
120
100
80
60
40
20
0
-20
-40
-40 10 60 110 160
Time (Ms)


INT LUMBAR TORQUE RESULTANT (IN-LB)
1800
1600
1400
1200
1000
800
600
400
200
0
-40 10 60 110 160
Time (Ms)


INT LUMBAR My TORQUE (IN-LB)
400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-40 10 60 110 160
Time (Ms)


INT LUMBAR Mz TORQUE (IN-LB)
100
50
0
-50
-100
-40 10 60 110 160
Time (Ms)

201404 Test: 8854 Test Date: 140815 Subj: LARD Cell: T15

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201404 Test: 8900 Test Date: 140825 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: U15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 7.0 | |
| Impact Rise Time (Ms) | | | | 34.0 | |
| Impact Duration (Ms) | | | | 106.0 | |
| Velocity Change (Ft/Sec) | | 30.08 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.03 | 15.28 | -0.64 | 34.0 | 128.0 |
| SLED Y ACCEL (G) | 0.00 | 0.41 | -0.71 | 11.0 | 45.0 |
| SLED Z ACCEL (G) | 1.00 | 3.45 | -1.32 | 39.0 | 29.0 |
| SLED VELOCITY (FT/SEC) | 0.18 | 28.59 | 0.19 | 171.0 | 0.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.08 | 0.02 | 106.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | 0.68 | 3.61 | -16.09 | 152.0 | 31.0 |
| SEAT Y ACCEL (G) | 0.00 | 0.64 | -1.59 | 146.0 | 55.0 |
| SEAT Z ACCEL (G) | 0.68 | 2.34 | -12.75 | 139.0 | 38.0 |
| SEAT RESULTANT | 0.96 | 17.87 | 0.23 | 31.0 | 101.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -5.49 | 0.98 | -114.30 | 138.0 | 66.0 |
| LEFT LAP Y FORCE (LB) | 9.45 | 74.12 | 3.12 | 79.0 | 157.0 |
| LEFT LAP Z FORCE (LB) | -20.41 | 4.19 | -342.21 | 153.0 | 77.0 |
| LEFT LAP RESULTANT (LB) | 23.15 | 367.02 | 3.83 | 77.0 | 157.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -5.08 | -0.42 | -166.93 | 152.0 | 75.0 |
| RIGHT LAP Y FORCE (LB) | -5.15 | 7.40 | -143.95 | 162.0 | 75.0 |
| RIGHT LAP Z FORCE (LB) | -22.69 | 13.89 | -476.34 | 159.0 | 76.0 |
| RIGHT LAP RESULTANT (LB) | 23.82 | 524.55 | 3.37 | 76.0 | 137.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -13.29 | -5.17 | -786.33 | 176.0 | 94.0 |
| LEFT SHOULDER Y FORCE (LB) | 2.68 | 5.69 | -7.91 | 112.0 | 82.0 |
| LEFT SHOULDER Z FORCE (LB) | -2.19 | 161.96 | -2.28 | 94.0 | 2.0 |
| LEFT SHOULDER RESULTANT (LB) | 13.74 | 802.85 | 6.77 | 94.0 | 175.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -14.31 | -5.89 | -821.32 | 175.0 | 97.0 |
| RIGHT SHOULDER Y FORCE (LB) | 0.41 | 28.05 | -1.10 | 101.0 | 18.0 |
| RIGHT SHOULDER Z FORCE (LB) | -5.10 | 164.98 | -5.13 | 96.0 | 2.0 |
| RIGHT SHOULDER RESULTANT (LE | 15.20 | 838.06 | 6.57 | 97.0 | 176.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | 0.69 | 7.06 | -28.52 | 62.0 | 128.0 |
| INT HEAD Y ACCEL (G) | 0.01 | 0.77 | -0.68 | 62.0 | 112.0 |
| INT HEAD Z ACCEL (G) | 0.73 | 14.45 | -31.43 | 61.0 | 98.0 |
| INT HEAD RESULTANT (G) | 1.00 | 38.02 | 0.64 | 102.0 | 19.0 |
| INT HEAD HIC | | 168.90 | | 92.0 | 122.0 |
| INT HEAD Ry ANG (RAD/SEC2) | -2.14 | 2293.50 | -1968.95 | 85.0 | 115.0 |

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201404 Test: 8900 Test Date: 140825 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: U15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | 5.81 | 78.13 | -398.51 | 70.0 | 130.0 |
| INT NECK Y FORCE (LB) | -2.94 | 2.50 | -15.17 | 134.0 | 97.0 |
| INT NECK Z FORCE (LB) | -3.02 | 354.77 | -158.91 | 98.0 | 61.0 |
| INT NECK RESULTANT (LB) | 7.23 | 440.80 | 6.29 | 129.0 | 18.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 4.46 | 23.18 | -20.79 | 135.0 | 109.0 |
| INT NECK My TORQUE (IN-LB) | -4.58 | 434.25 | -291.31 | 116.0 | 86.0 |
| INT NECK Mz TORQUE (IN-LB) | -5.45 | 7.90 | -16.99 | 132.0 | 108.0 |
| INT NECK TORQUE RES (IN-LB) | 8.42 | 434.32 | 7.09 | 116.0 | 8.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | 0.69 | 2.32 | -18.63 | 120.0 | 94.0 |
| INT CHEST Y ACCEL (G) | 0.00 | 0.37 | -1.43 | 165.0 | 96.0 |
| INT CHEST Z ACCEL (G) | 0.73 | 16.25 | -5.88 | 60.0 | 94.0 |
| INT CHEST RESULTANT (G) | 1.01 | 19.58 | 0.72 | 94.0 | 17.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | 0.67 | 15.26 | -13.95 | 161.0 | 78.0 |
| INT LUMBAR Y ACCEL (G) | 0.00 | 2.58 | -1.95 | 87.0 | 165.0 |
| INT LUMBAR Z ACCEL (G) | 0.75 | 22.10 | -4.09 | 67.0 | 154.0 |
| INT LUMBAR RESULTANT (G) | 1.01 | 25.78 | 0.81 | 66.0 | 14.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | -6.97 | 36.25 | -239.68 | 49.0 | 79.0 |
| INT LUMBAR Y FORCE (LB) | -1.09 | 43.84 | -16.66 | 62.0 | 151.0 |
| INT LUMBAR Z FORCE (LB) | -43.67 | 281.71 | -1717.92 | 128.0 | 60.0 |
| INT LUMBAR FORCE RESULTANT ( | 44.24 | 1720.99 | 42.03 | 60.0 | 7.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 32.24 | 254.97 | -32.50 | 69.0 | 152.0 |
| INT LUMBAR My TORQUE (IN-LB) | 2.92 | 145.72 | -1146.38 | 30.0 | 76.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -2.77 | 9.39 | -5.85 | 162.0 | 89.0 |
| INT LUMBAR TORQUE RESULTANT | 32.51 | 1168.89 | 30.03 | 76.0 | 14.0 |

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201404 Test: 8900 Test Date: 140825 Subj: LARD Wt: 244.0
Nom G: 15.0 Cell: U15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 78.13 | -398.51 | 70.0 | 130.0 |
| NIJ TENSION (LB) | | 354.77 | | 98.0 | |
| NIJ COMPRESSION (LB) | | -158.91 | | 61.0 | |
| NIJ FLEXION (IN-LB) | | 609.98 | | 128.0 | |
| NIJ EXTENSION (IN-LB) | | 284.66 | | 85.0 | |
| NIJ NTF | 0.0000 | 0.3083 | 0.0000 | 114.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.2655 | 0.0000 | 88.0 | 0.0 |
| NIJ NCF | 0.0000 | 0.0985 | 0.0000 | 60.0 | 0.0 |
| NIJ NCE | 0.0073 | 0.0982 | 0.0000 | 51.0 | 55.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.16 | | | |
| NIJ NTF AIS >= 3 | | 0.07 | | | |
| NIJ NTF AIS >= 4 | | 0.09 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.15 | | | |
| NIJ NTE AIS >= 3 | | 0.06 | | | |
| NIJ NTE AIS >= 4 | | 0.09 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.13 | | | |
| NIJ NCF AIS >= 3 | | 0.05 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.13 | | | |
| NIJ NCE AIS >= 3 | | 0.05 | | | |
| NIJ NCE AIS >= 4 | | 0.07 | | | |
| NIJ NCE AIS >= 5 | | 0.02 | | | |
| | | | | | |
| MNIx | 0.0028 | 0.0146 | 0.0001 | 135.0 | 79.0 |
| NMIz | 0.0034 | 0.0107 | 0.0001 | 108.0 | 62.0 |

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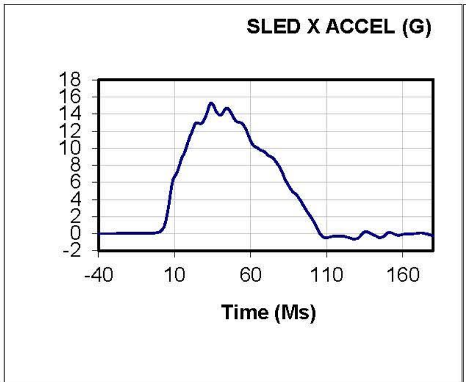
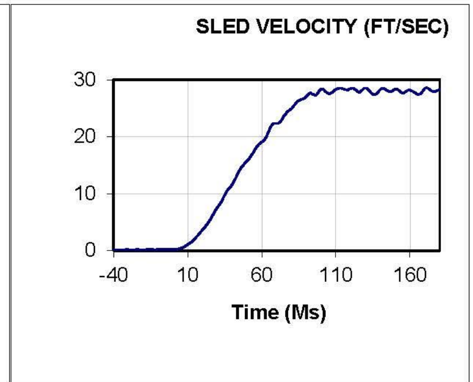
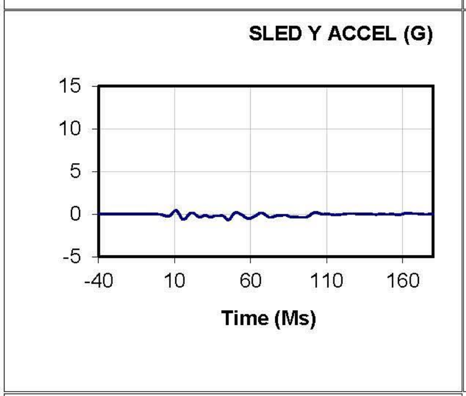
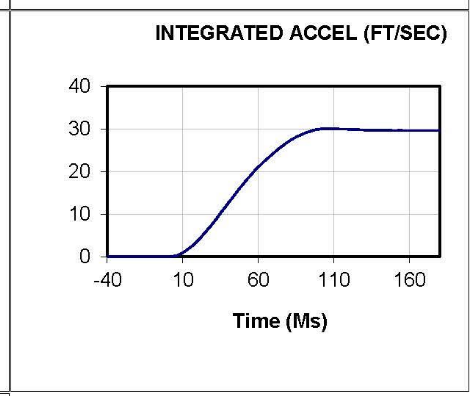
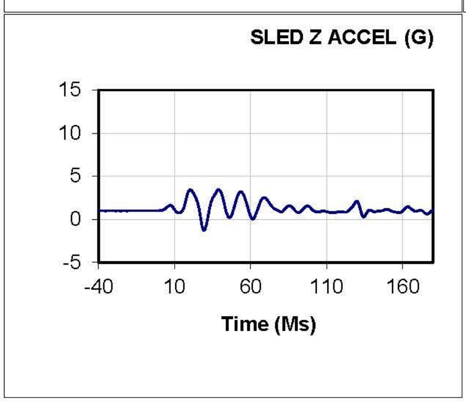
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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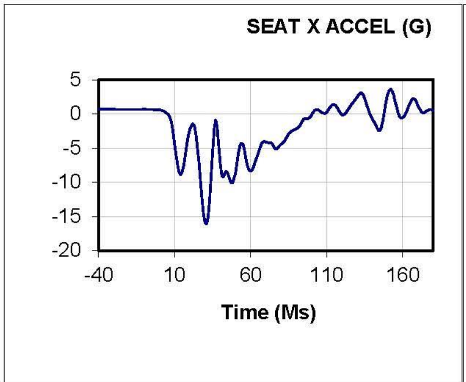
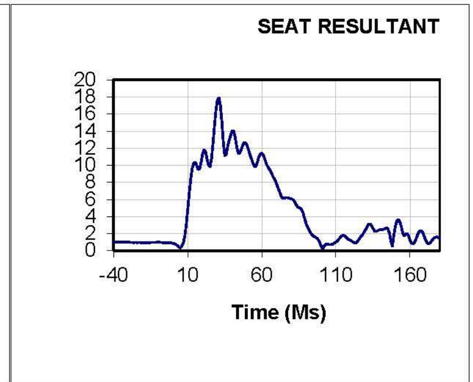
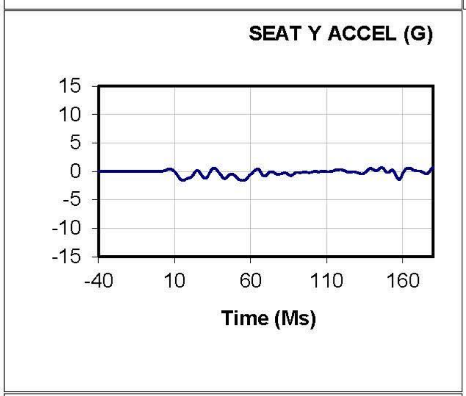
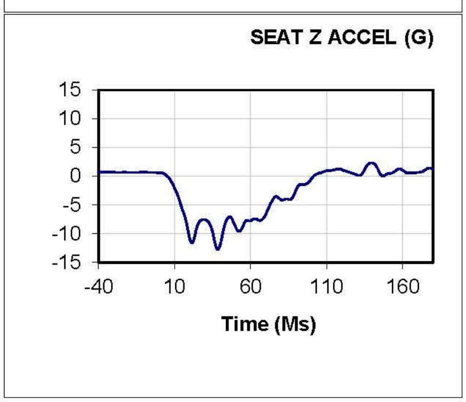
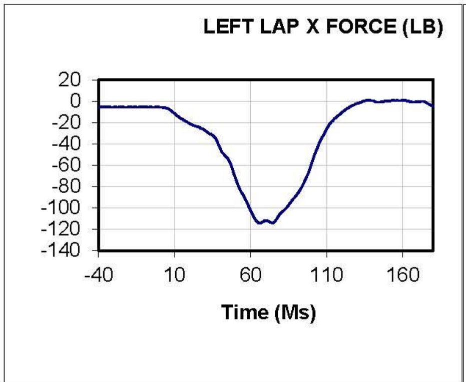
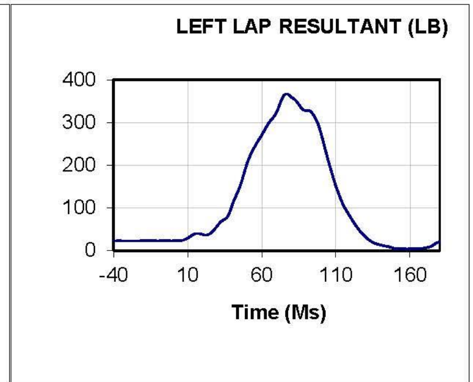

SEAT X ACCEL (G)
5
0
-5
-10
-15
-20
-40
10
60
110
160
Time (Ms)

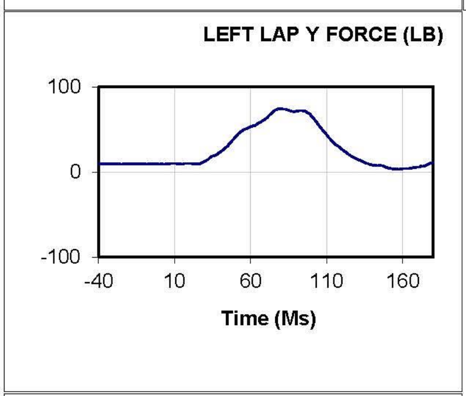

SEAT RESULTANT
20
18
16
14
12
10
8
6
4
2
0
-40
10
60
110
160
Time (Ms)

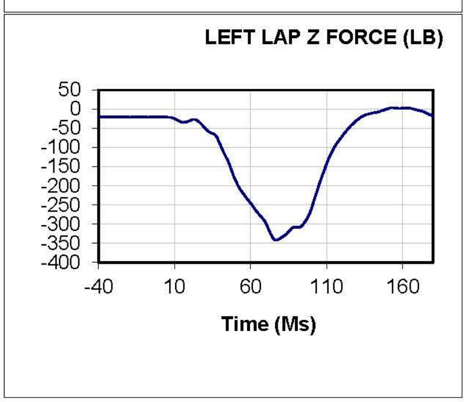

SEAT Y ACCEL (G)
15
10
5
0
-5
-10
-15
-40
10
60
110
160
Time (Ms)


SEAT Z ACCEL (G)
15
10
5
0
-5
-10
-15
-40
10
60
110
160
Time (Ms)

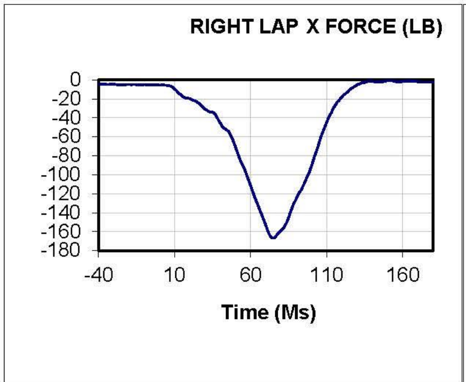

LEFT LAP X FORCE (LB)
20
0
-20
-40
-60
-80
-100
-120
-140
-40
10
60
110
160
Time (Ms)

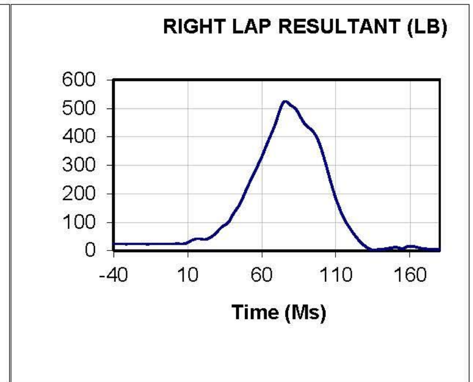

LEFT LAP RESULTANT (LB)
400
300
200
100
0
-40
10
60
110
160
Time (Ms)

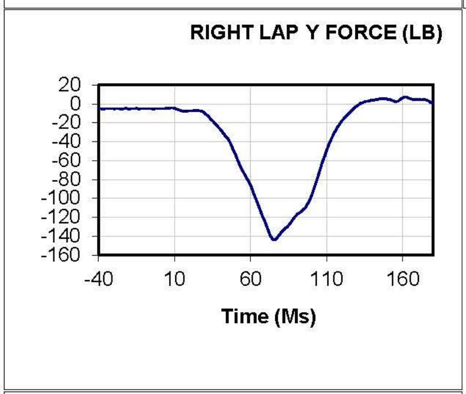

LEFT LAP Y FORCE (LB)
100
0
-100
-40
10
60
110
160
Time (Ms)

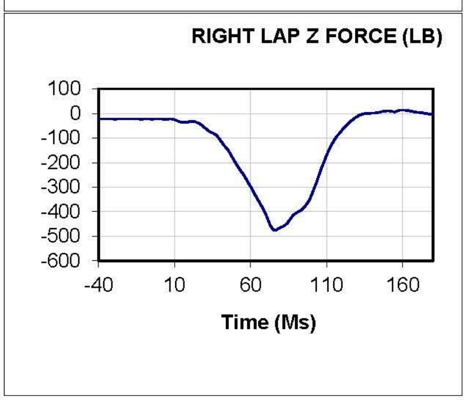

LEFT LAP Z FORCE (LB)
50
0
-50
-100
-150
-200
-250
-300
-350
-400
-40
10
60
110
160
Time (Ms)

201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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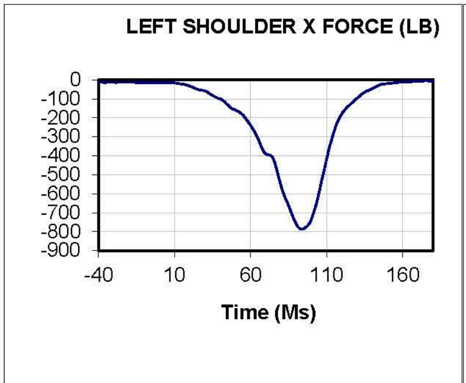
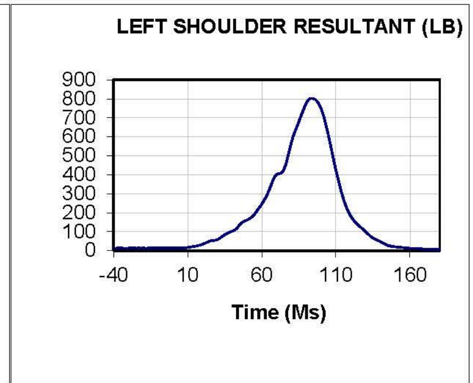
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15



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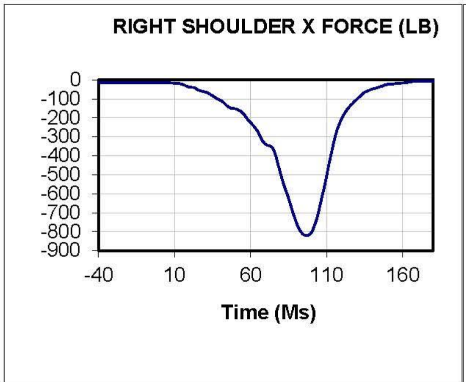
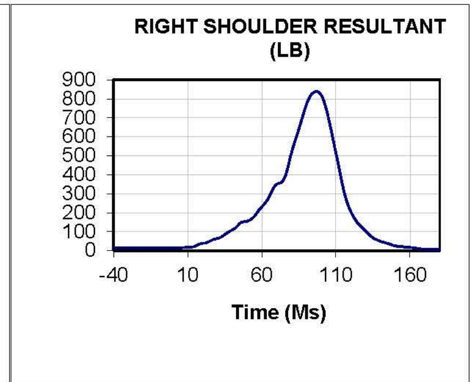
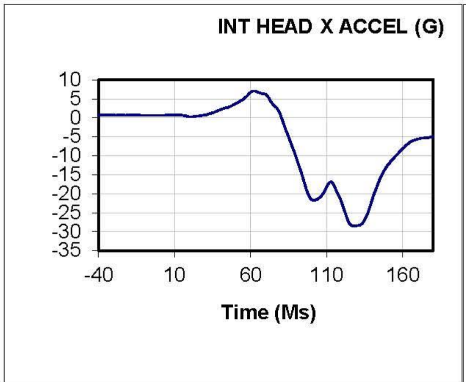

RIGHT SHOULDER X FORCE (LB)
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-40
10
60
110
160
Time (Ms)

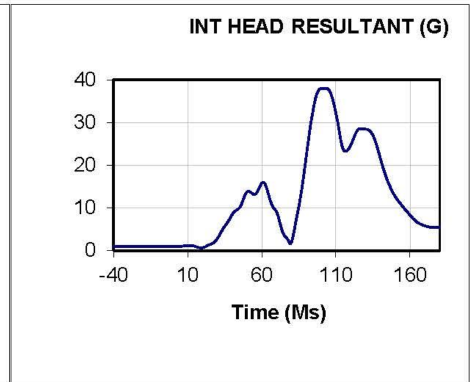

RIGHT SHOULDER RESULTANT (LB)
900
800
700
600
500
400
300
200
100
0
-40
10
60
110
160
Time (Ms)

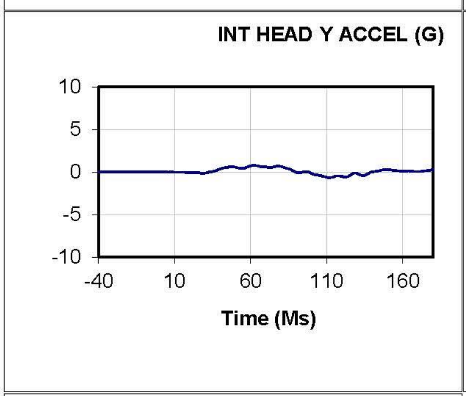

RIGHT SHOULDER Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

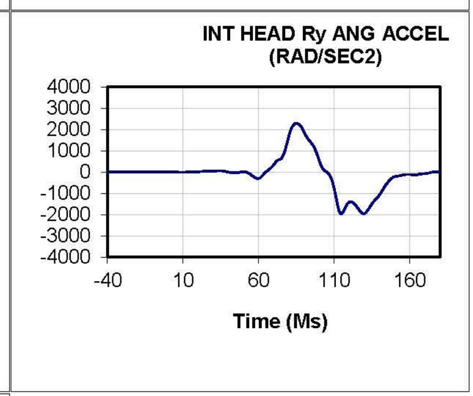

RIGHT SHOULDER Z FORCE (LB)
200
100
0
-100
-200
-40
10
60
110
160
Time (Ms)

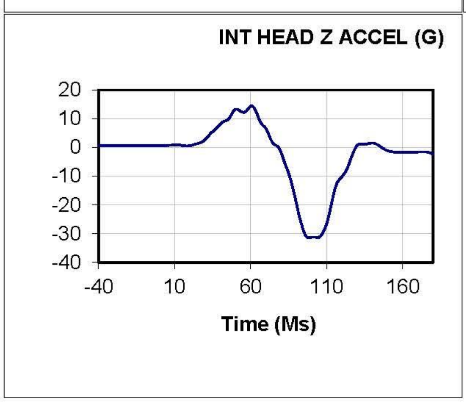
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

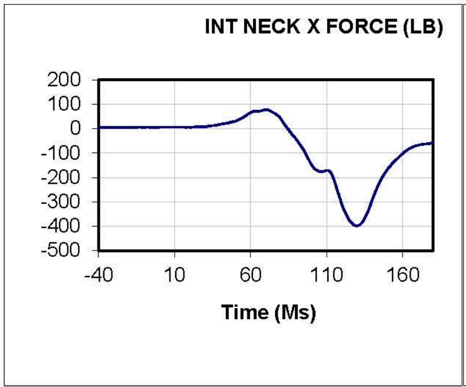


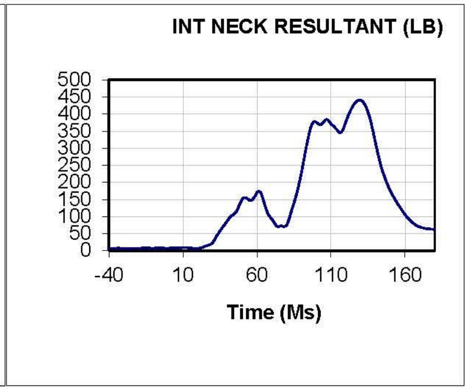



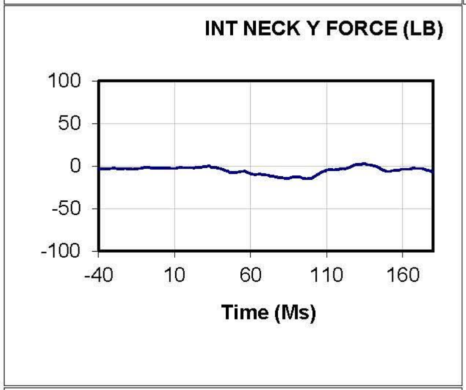



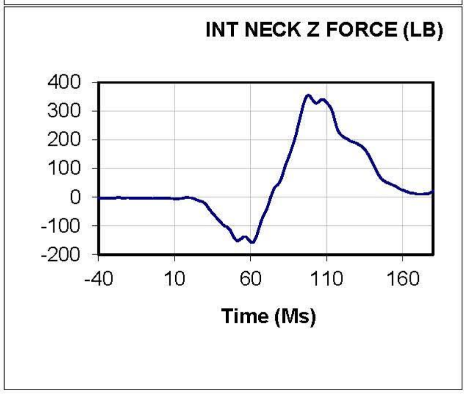



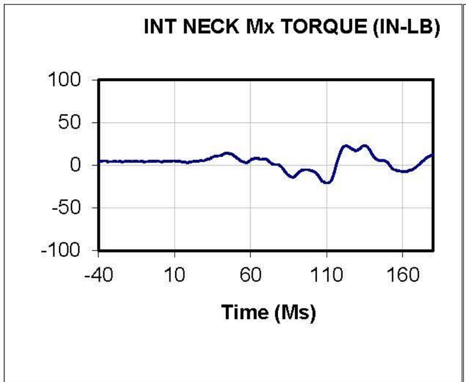

INT NECK X FORCE (LB)
200
100
0
-100
-200
-300
-400
-500
-40
10
60
110
160
Time (Ms)

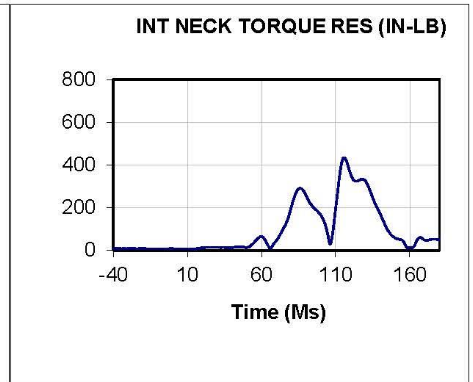

INT NECK RESULTANT (LB)
500
450
400
350
300
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

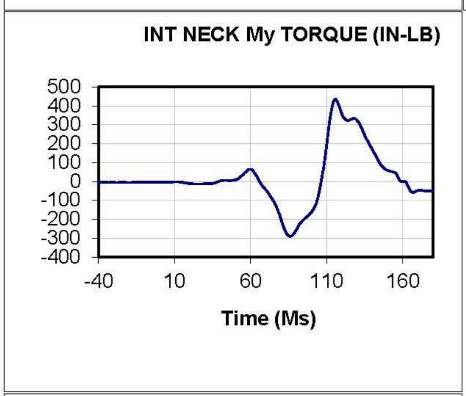

INT NECK Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

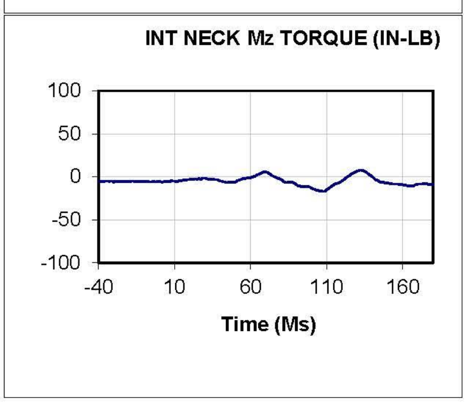

INT NECK Z FORCE (LB)
400
300
200
100
0
-100
-200
-40
10
60
110
160
Time (Ms)

201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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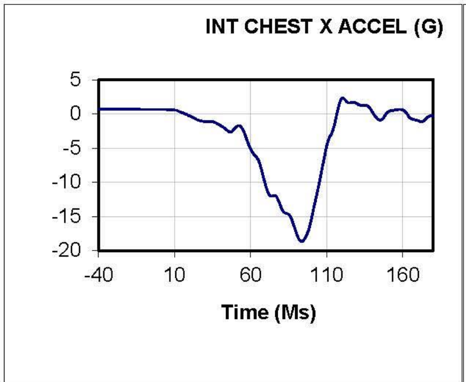
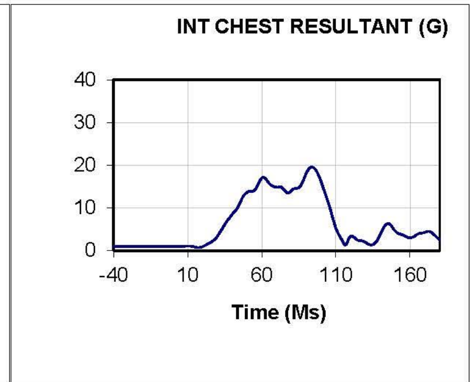
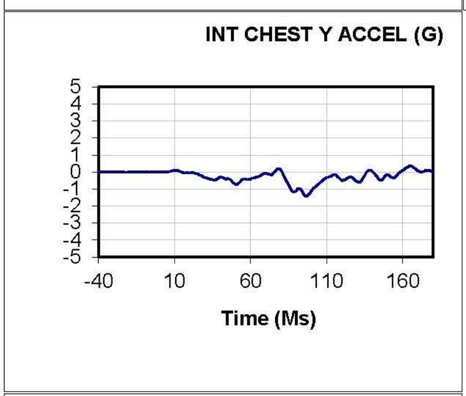
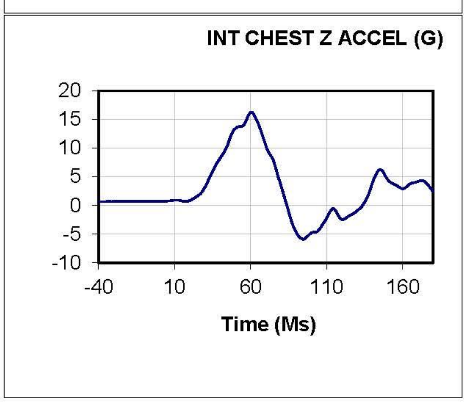
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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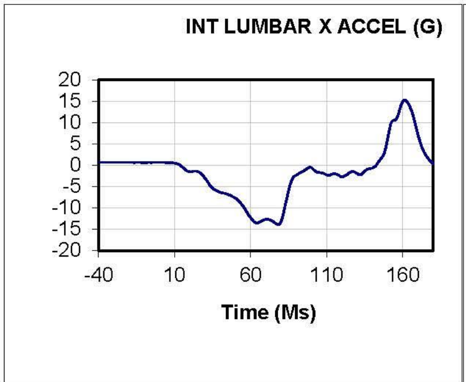
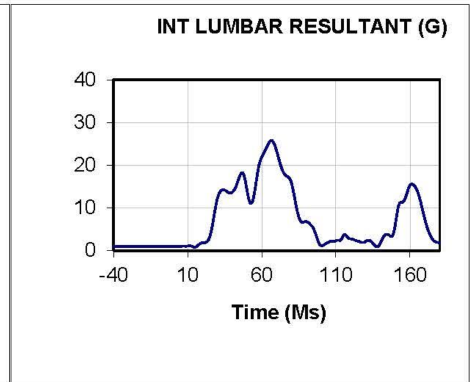
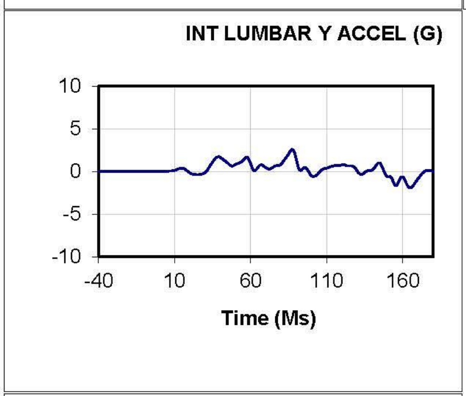
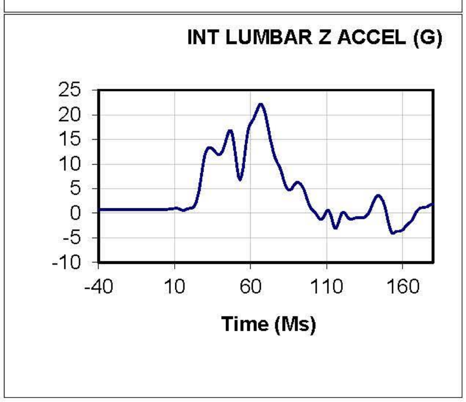
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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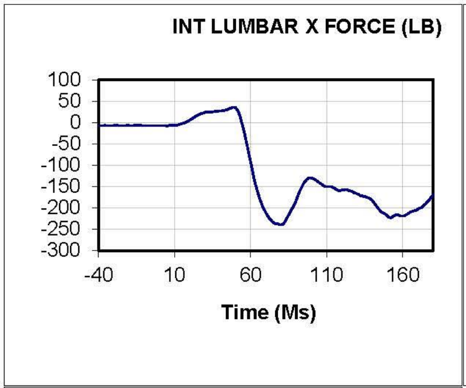
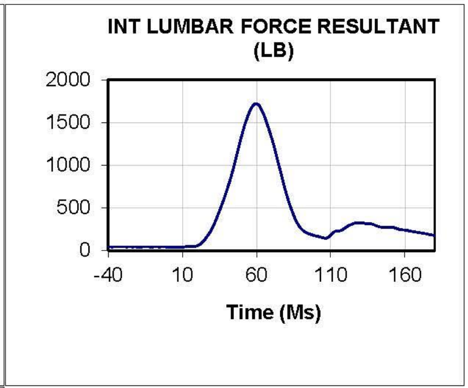
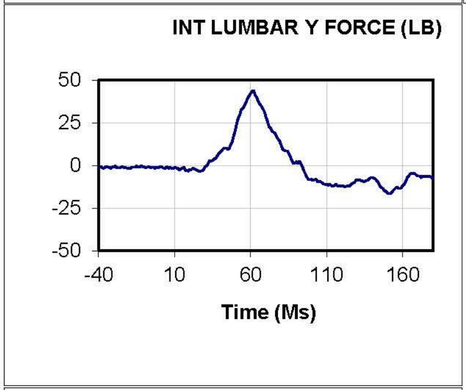
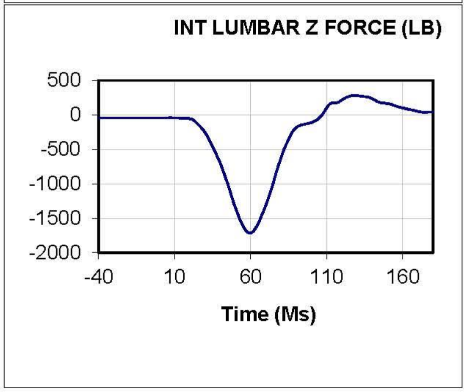
201404 Test: 8900 Test Date: 140825 Subj: LARD Cell: U15

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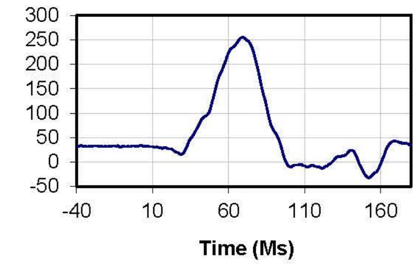
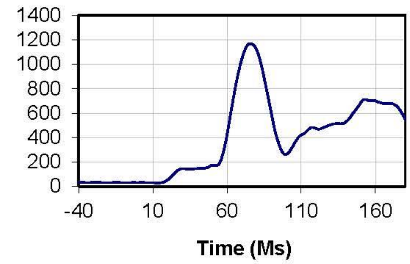
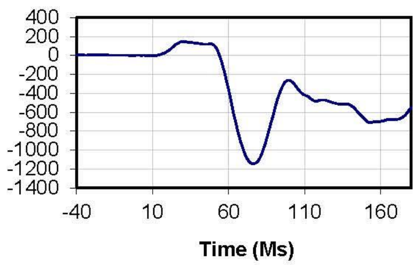
INT LUMBAR Mx TORQUE (IN-LB)



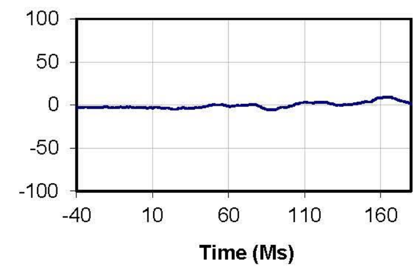

INT LUMBAR TORQUE RESULTANT (IN-LB)

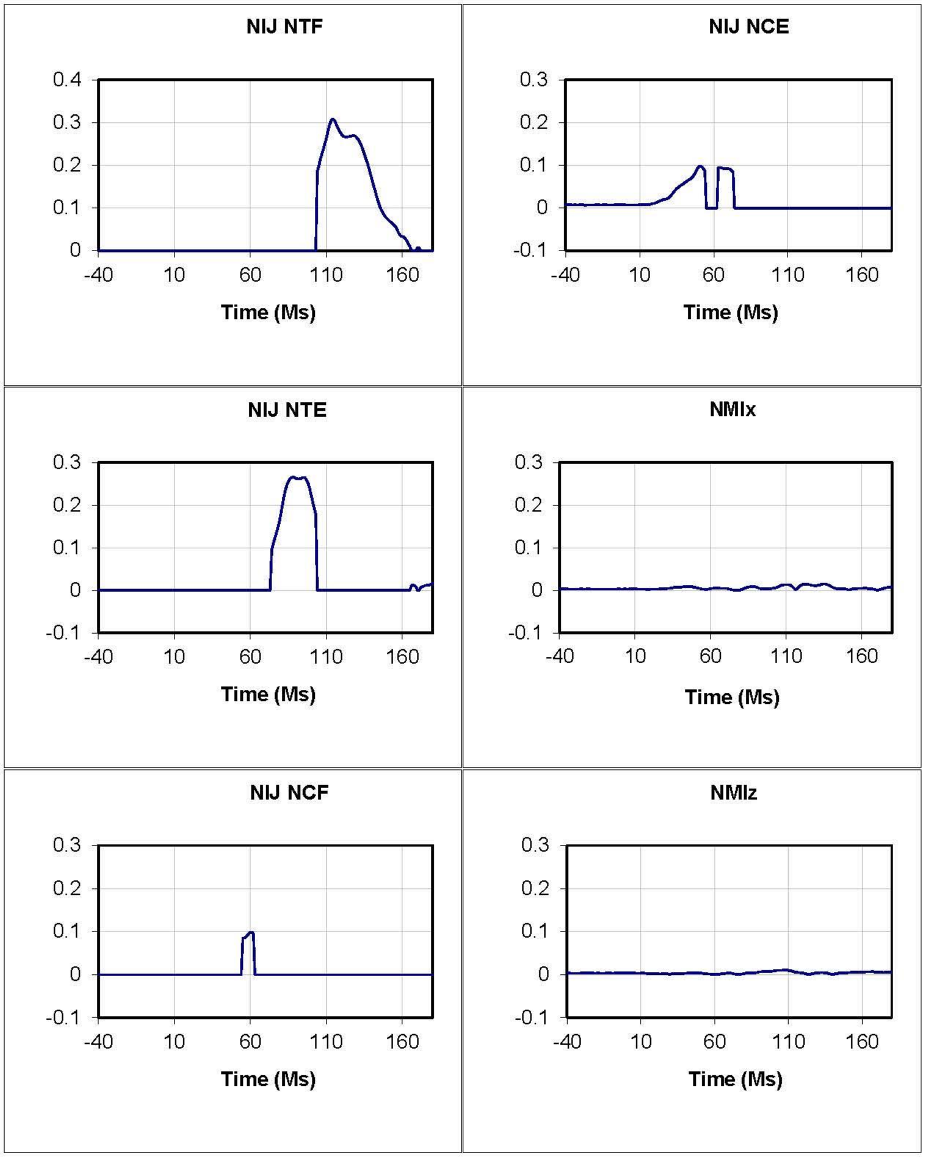



INT LUMBAR My TORQUE (IN-LB)




INT LUMBAR Mz TORQUE (IN-LB)




NIJ NTF
0.4
0.3
0.2
0.1
0
-40
10
60
110
160
Time (Ms)
NIJ NCE
0.3
0.2
0.1
0
-0.1
-40
10
60
110
160
Time (Ms)
NIJ NTE
0.3
0.2
0.1
0
-0.1
-40
10
60
110
160
Time (Ms)
NMIx
0.3
0.2
0.1
0
-0.1
-40
10
60
110
160
Time (Ms)
NIJ NCF
0.3
0.2
0.1
0
-0.1
-40
10
60
110
160
Time (Ms)
NMIz
0.3
0.2
0.1
0
-0.1
-40
10
60
110
160
Time (Ms)

201404 Test: 9030 Test Date: 150312 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: W15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| Reference Mark Time (Ms) | | | | 5.0 | |
| Impact Rise Time (Ms) | | | | 42.0 | |
| Impact Duration (Ms) | | | | 105.0 | |
| Velocity Change (Ft/Sec) | | 30.80 | | | |
| | | | | | |
| SLED X ACCEL (G) | 0.02 | 14.92 | -0.61 | 42.0 | 108.0 |
| SLED Y ACCEL (G) | 0.00 | 1.93 | -0.58 | 62.0 | 10.0 |
| SLED Z ACCEL (G) | 1.00 | 3.34 | -2.02 | 28.0 | 36.0 |
| SLED VELOCITY (FT/SEC) | 0.18 | 30.83 | 0.21 | 104.0 | 1.0 |
| INTEGRATED ACCEL (FT/SEC) | 0.00 | 30.80 | 0.02 | 104.0 | 0.0 |
| | | | | | |
| SEAT X ACCEL (G) | 0.69 | 3.09 | -15.78 | 125.0 | 29.0 |
| SEAT Y ACCEL (G) | 0.01 | 1.55 | -1.54 | 32.0 | 36.0 |
| SEAT Z ACCEL (G) | 0.72 | 13.28 | -1.86 | 36.0 | 134.0 |
| SEAT RESULTANT | 1.00 | 18.44 | 0.25 | 29.0 | 116.0 |
| | | | | | |
| LEFT LAP X FORCE (LB) | -13.09 | -1.31 | -218.07 | 162.0 | 82.0 |
| LEFT LAP Y FORCE (LB) | -3.19 | 42.70 | -4.58 | 80.0 | 138.0 |
| LEFT LAP Z FORCE (LB) | 6.80 | 105.61 | 1.97 | 79.0 | 140.0 |
| LEFT LAP RESULTANT (LB) | 15.10 | 245.68 | 5.20 | 82.0 | 162.0 |
| | | | | | |
| RIGHT LAP X FORCE (LB) | -17.44 | -2.89 | -488.88 | 150.0 | 79.0 |
| RIGHT LAP Y FORCE (LB) | 1.47 | 208.09 | -3.55 | 74.0 | 141.0 |
| RIGHT LAP Z FORCE (LB) | -2.07 | 135.46 | -5.40 | 79.0 | 169.0 |
| RIGHT LAP RESULTANT (LB) | 17.62 | 546.73 | 5.99 | 79.0 | 153.0 |
| | | | | | |
| LEFT SHOULDER X FORCE (LB) | -14.90 | -3.74 | -1130.05 | 171.0 | 89.0 |
| LEFT SHOULDER Y FORCE (LB) | 3.55 | 7.08 | -19.96 | 114.0 | 75.0 |
| LEFT SHOULDER Z FORCE (LB) | 4.40 | 372.79 | 3.54 | 87.0 | 174.0 |
| LEFT SHOULDER RESULTANT (LB) | 15.94 | 1189.53 | 6.71 | 89.0 | 171.0 |
| | | | | | |
| RIGHT SHOULDER X FORCE (LB) | -13.44 | -1.62 | -798.70 | 174.0 | 89.0 |
| RIGHT SHOULDER Y FORCE (LB) | 2.66 | 12.55 | -0.71 | 107.0 | 38.0 |
| RIGHT SHOULDER Z FORCE (LB) | 2.85 | 236.92 | 2.74 | 89.0 | 3.0 |
| RIGHT SHOULDER RESULTANT (LB) | 14.00 | 833.11 | 4.63 | 89.0 | 174.0 |
| | | | | | |
| INT HEAD X ACCEL (G) | 0.70 | 3.47 | -21.49 | 58.0 | 103.0 |
| INT HEAD Y ACCEL (G) | 0.00 | 2.56 | -0.73 | 137.0 | 111.0 |
| INT HEAD Z ACCEL (G) | 0.72 | 10.42 | -22.32 | 44.0 | 94.0 |
| INT HEAD RESULTANT (G) | 1.00 | 30.51 | 0.53 | 97.0 | 68.0 |
| INT HEAD HIC | | 99.68 | | 80.0 | 110.0 |
| INT HEAD Ry ANG (RAD/SEC2) | 0.23 | 1787.81 | -1907.57 | 76.0 | 111.0 |

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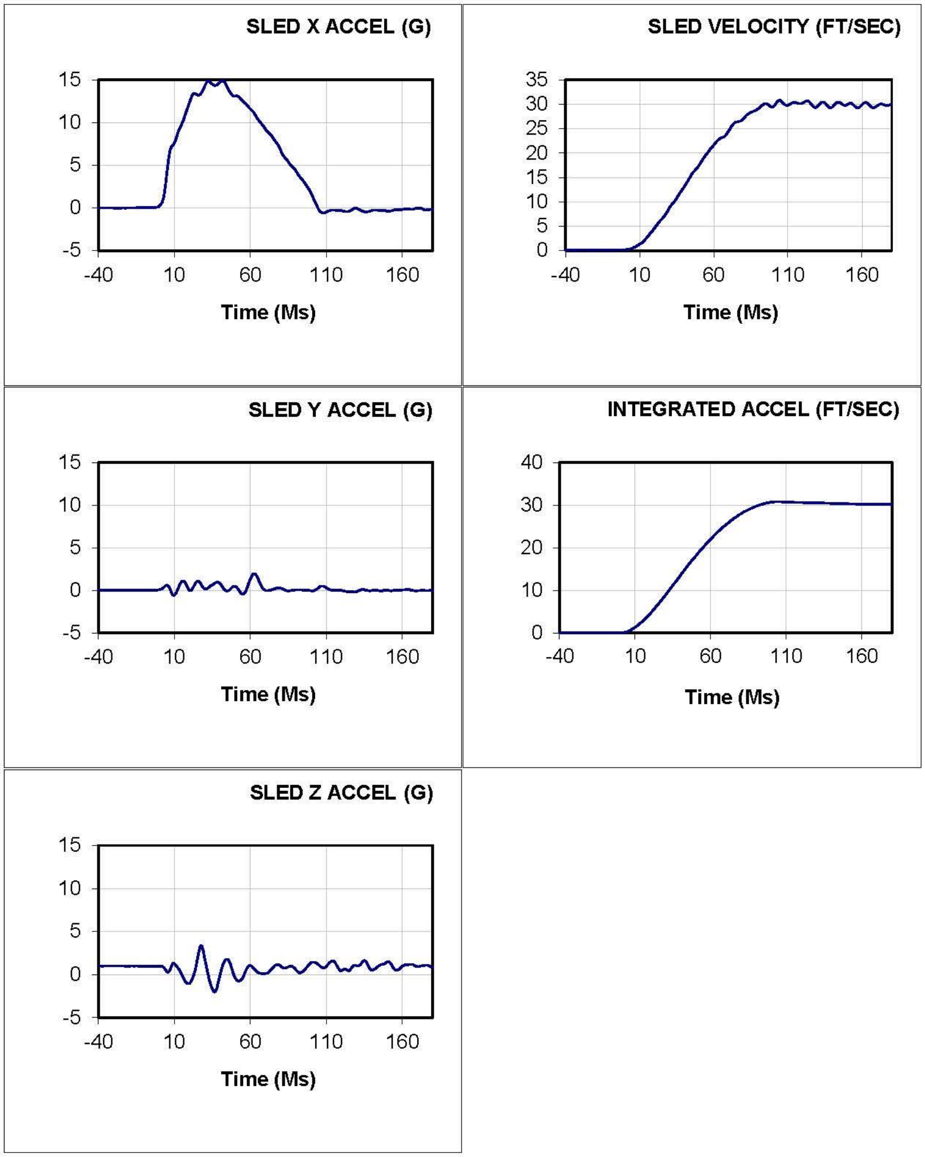
201404 Test: 9030 Test Date: 150312 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: W15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| INT NECK X FORCE (LB) | -13.44 | 47.80 | -341.57 | 58.0 | 123.0 |
| INT NECK Y FORCE (LB) | 0.30 | 14.81 | -8.06 | 91.0 | 136.0 |
| INT NECK Z FORCE (LB) | -1.36 | 373.17 | -146.32 | 92.0 | 46.0 |
| INT NECK RESULTANT (LB) | 13.53 | 416.76 | 6.05 | 93.0 | 18.0 |
| | | | | | |
| INT NECK Mx TORQUE (IN-LB) | 8.46 | 44.80 | -23.24 | 100.0 | 154.0 |
| INT NECK My TORQUE (IN-LB) | 33.09 | 411.55 | -244.05 | 135.0 | 76.0 |
| INT NECK Mz TORQUE (IN-LB) | -5.75 | 3.74 | -43.98 | 93.0 | 136.0 |
| INT NECK TORQUE RES (IN-LB) | 34.64 | 415.96 | 6.17 | 135.0 | 59.0 |
| | | | | | |
| INT CHEST X ACCEL (G) | 0.69 | 1.32 | -18.72 | 173.0 | 85.0 |
| INT CHEST Y ACCEL (G) | 0.01 | 0.61 | -2.76 | 148.0 | 70.0 |
| INT CHEST Z ACCEL (G) | 0.72 | 13.33 | -2.63 | 59.0 | 95.0 |
| INT CHEST RESULTANT (G) | 1.00 | 18.84 | 0.32 | 85.0 | 125.0 |
| | | | | | |
| INT LUMBAR X ACCEL (G) | 0.70 | 9.62 | -13.07 | 174.0 | 67.0 |
| INT LUMBAR Y ACCEL (G) | 0.00 | 1.88 | -2.42 | 163.0 | 74.0 |
| INT LUMBAR Z ACCEL (G) | 0.70 | 4.83 | -16.59 | 108.0 | 65.0 |
| INT LUMBAR RESULTANT (G) | 0.99 | 20.95 | 0.34 | 66.0 | 14.0 |
| | | | | | |
| INT LUMBAR X FORCE (LB) | 27.76 | 295.95 | 21.58 | 72.0 | 18.0 |
| INT LUMBAR Y FORCE (LB) | -13.16 | 1.05 | -22.01 | 74.0 | 108.0 |
| INT LUMBAR Z FORCE (LB) | -29.20 | 260.12 | -1436.01 | 130.0 | 54.0 |
| INT LUMBAR FORCE RESULTANT (LB) | 42.39 | 1443.14 | 41.68 | 54.0 | 5.0 |
| | | | | | |
| INT LUMBAR Mx TORQUE (IN-LB) | 50.20 | 113.16 | -107.06 | 175.0 | 63.0 |
| INT LUMBAR My TORQUE (IN-LB) | -96.15 | -79.37 | -1546.30 | 20.0 | 73.0 |
| INT LUMBAR Mz TORQUE (IN-LB) | -2.29 | 10.58 | -5.65 | 73.0 | 49.0 |
| INT LUMBAR TORQUE RESULTANT (IN-LB) | 108.49 | 1548.89 | 99.16 | 73.0 | 19.0 |

201404 Test: 9030 Test Date: 150312 Subj: LARD Wt: 246.0
Nom G: 15.0 Cell: W15

| Data ID | Immediate Preimpact | Maximum Value | Minimum Value | Time Of Maximum | Time Of Minimum |
|---|---|---|---|---|---|
| NIJ SHEAR (LB) | | 47.80 | -341.57 | 58.0 | 123.0 |
| NIJ TENSION (LB) | | 373.17 | | 92.0 | |
| NIJ COMPRESSION (LB) | | -146.32 | | 46.0 | |
| NIJ FLEXION (IN-LB) | | 618.21 | | 126.0 | |
| NIJ EXTENSION (IN-LB) | | 217.15 | | 75.0 | |
| NIJ NTF | 0.0000 | 0.2923 | 0.0000 | 112.0 | 0.0 |
| NIJ NTE | 0.0000 | 0.2229 | 0.0000 | 91.0 | 0.0 |
| NIJ NCF | 0.0124 | 0.0916 | 0.0000 | 44.0 | 9.0 |
| NIJ NCE | 0.0000 | 0.1378 | 0.0000 | 64.0 | 0.0 |
| | | | | | |
| NIJ NTF AIS >= 2 | | 0.15 | | | |
| NIJ NTF AIS >= 3 | | 0.07 | | | |
| NIJ NTF AIS >= 4 | | 0.09 | | | |
| NIJ NTF AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NTE AIS >= 2 | | 0.14 | | | |
| NIJ NTE AIS >= 3 | | 0.06 | | | |
| NIJ NTE AIS >= 4 | | 0.08 | | | |
| NIJ NTE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| NIJ NCF AIS >= 2 | | 0.13 | | | |
| NIJ NCF AIS >= 3 | | 0.05 | | | |
| NIJ NCF AIS >= 4 | | 0.07 | | | |
| NIJ NCF AIS >= 5 | | 0.02 | | | |
| | | | | | |
| NIJ NCE AIS >= 2 | | 0.13 | | | |
| NIJ NCE AIS >= 3 | | 0.05 | | | |
| NIJ NCE AIS >= 4 | | 0.07 | | | |
| NIJ NCE AIS >= 5 | | 0.03 | | | |
| | | | | | |
| MNIx | 0.0053 | 0.0283 | 0.0000 | 100.0 | 119.0 |
| NMIz | 0.0036 | 0.0278 | 0.0000 | 136.0 | 71.0 |

201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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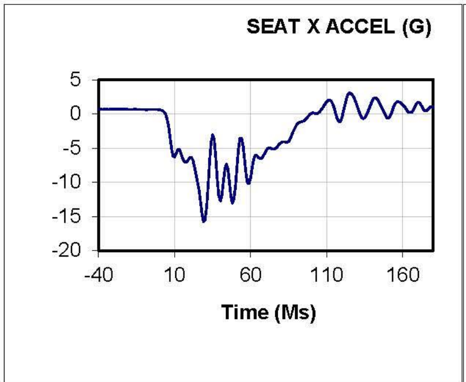
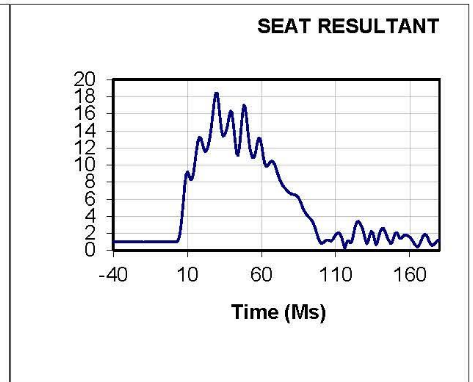
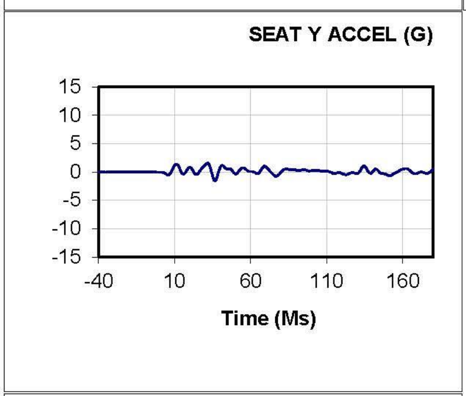
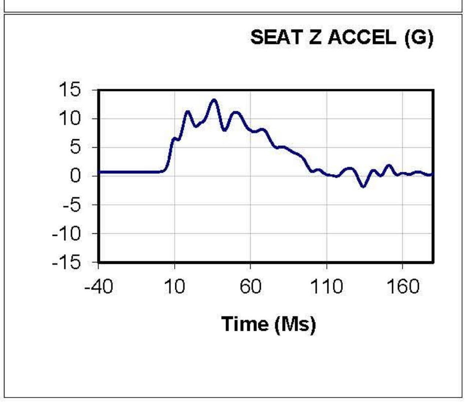
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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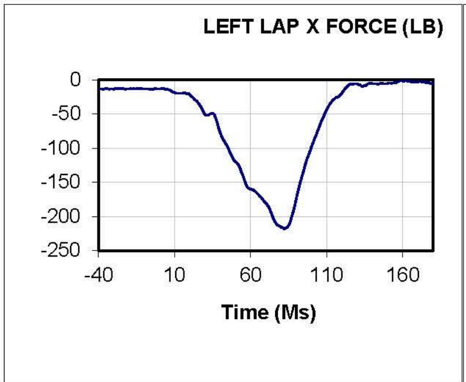
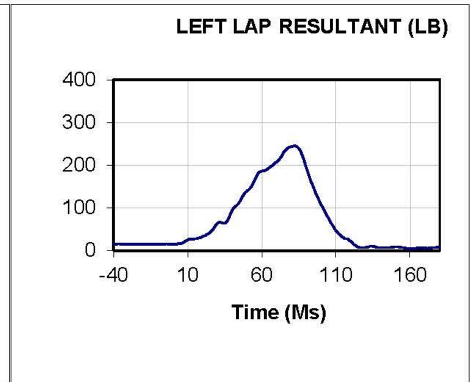
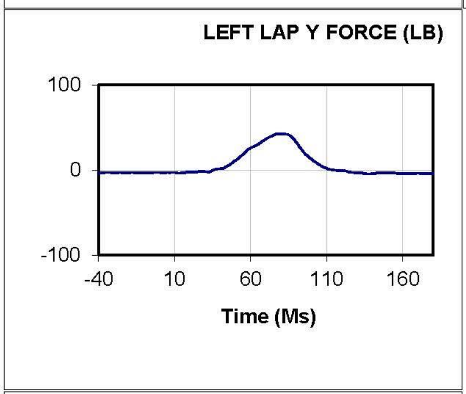
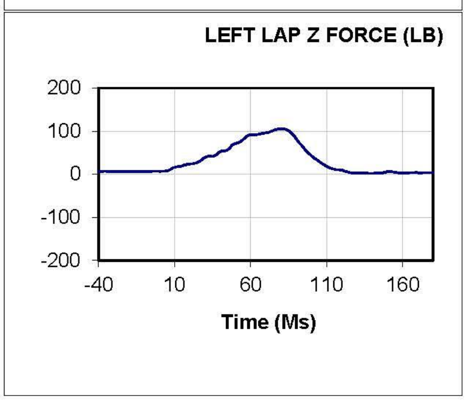
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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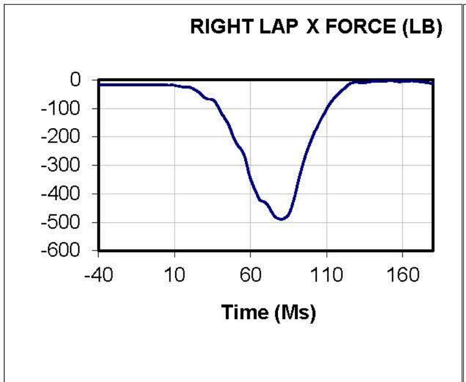
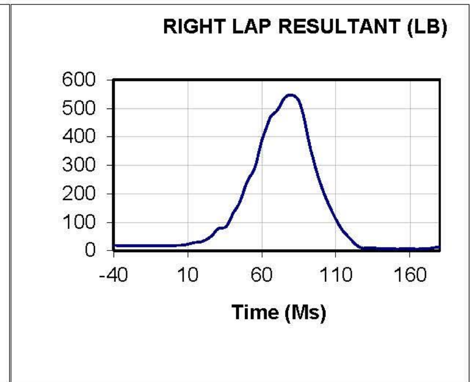
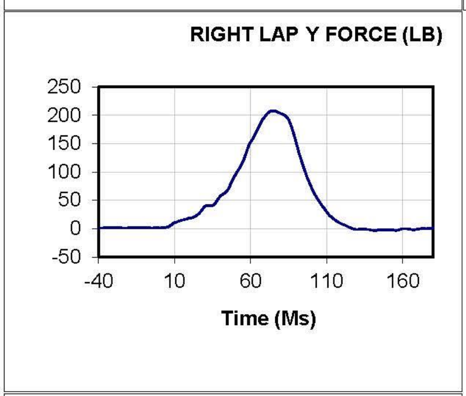
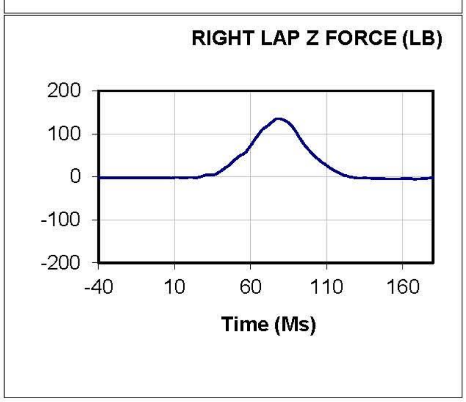
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

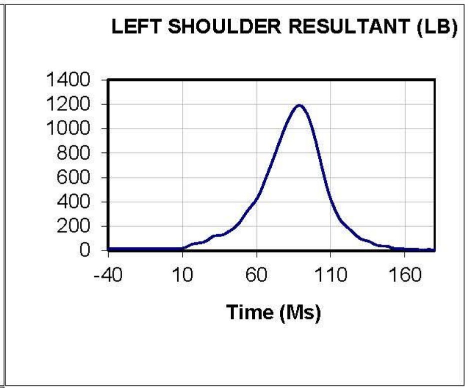


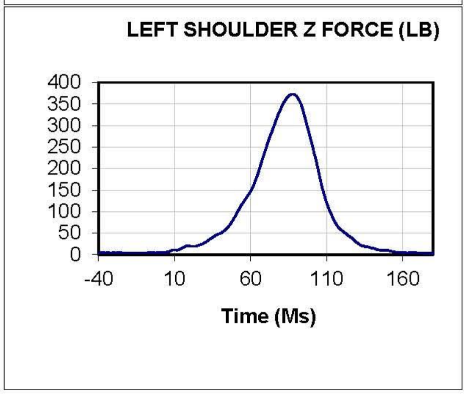



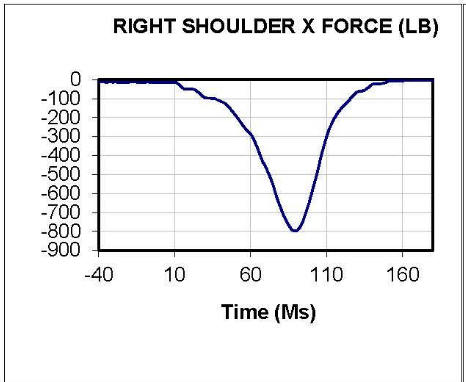



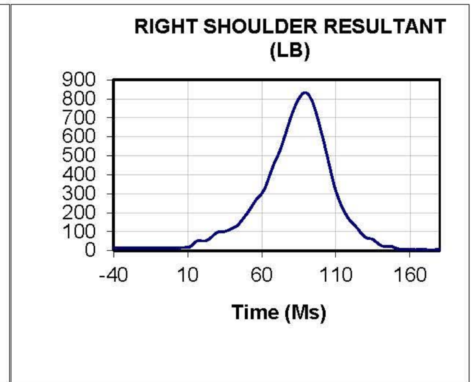

LEFT SHOULDER X FORCE (LB)
0
-200
-400
-600
-800
-1000
-1200
-40
10
60
110
160
Time (Ms)

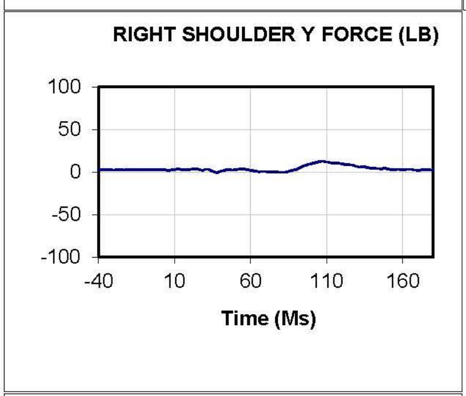

LEFT SHOULDER RESULTANT (LB)
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)

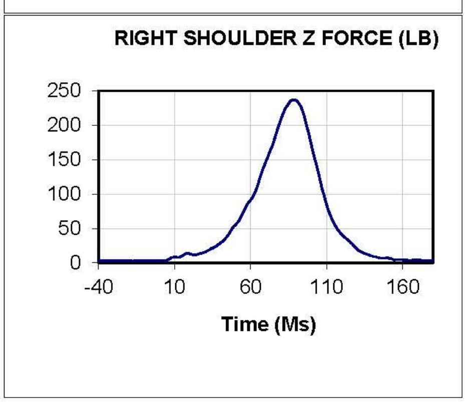

LEFT SHOULDER Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)


LEFT SHOULDER Z FORCE (LB)
400
350
300
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

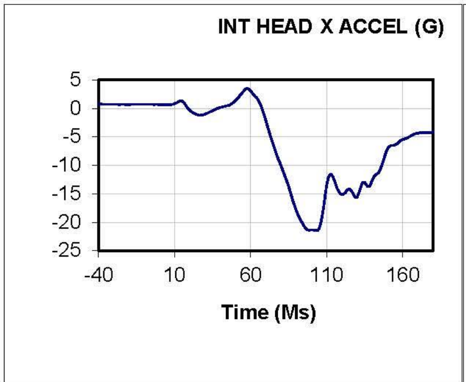

RIGHT SHOULDER X FORCE (LB)
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-40
10
60
110
160
Time (Ms)

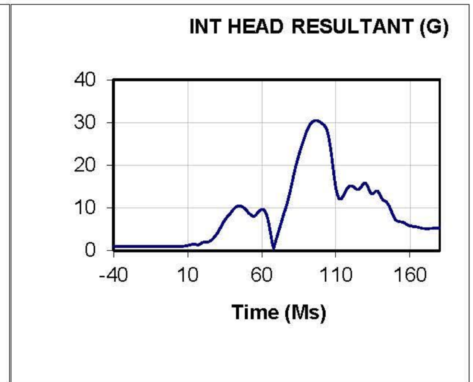

RIGHT SHOULDER RESULTANT (LB)
900
800
700
600
500
400
300
200
100
0
-40
10
60
110
160
Time (Ms)

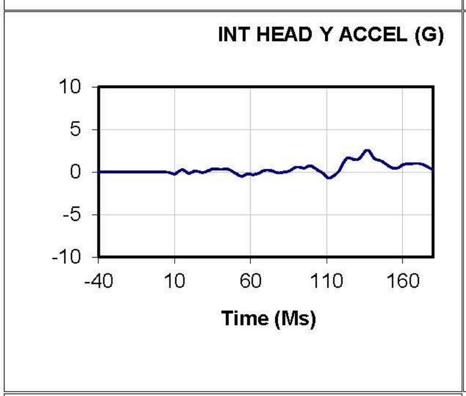

RIGHT SHOULDER Y FORCE (LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

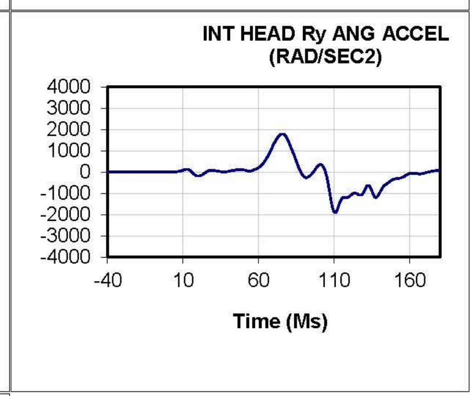

RIGHT SHOULDER Z FORCE (LB)
250
200
150
100
50
0
-40
10
60
110
160
Time (Ms)

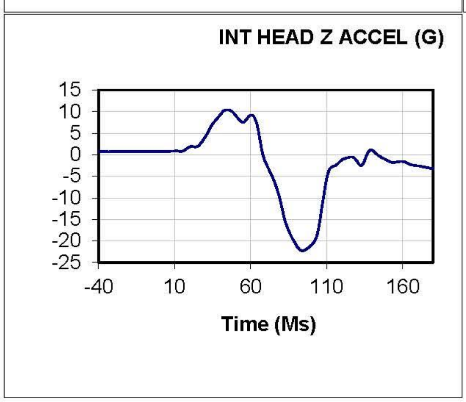
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15



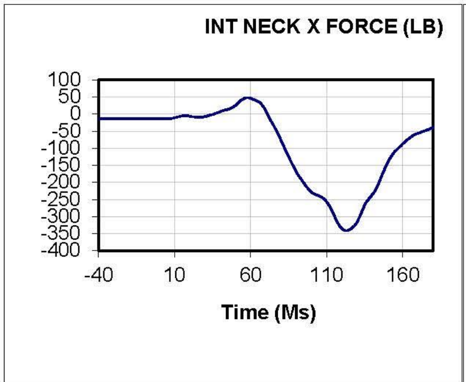



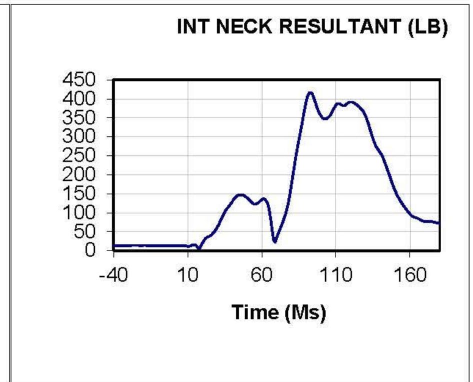



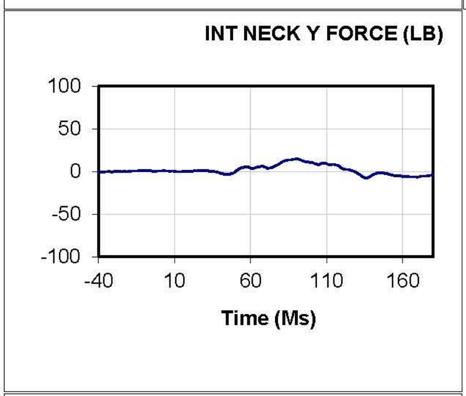



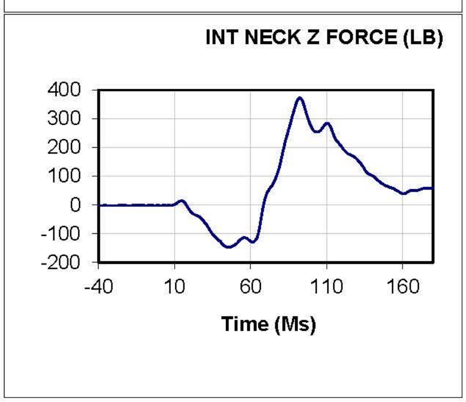



201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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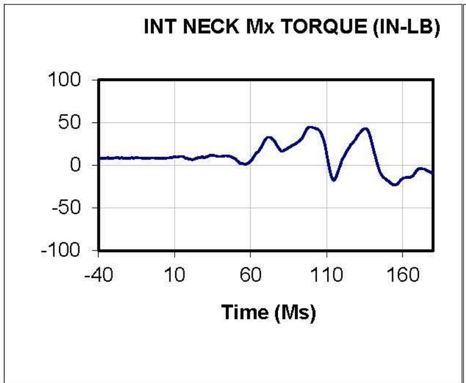
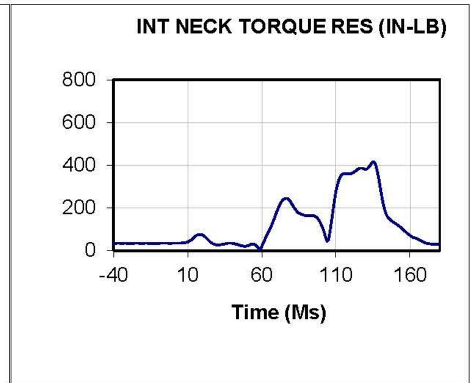
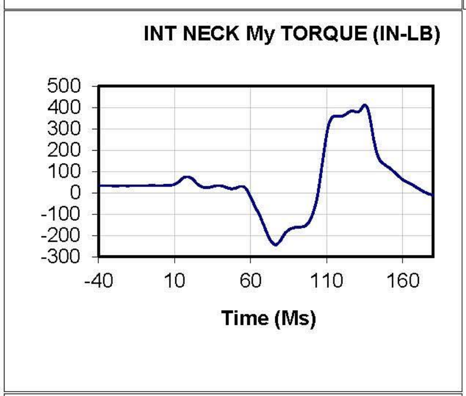
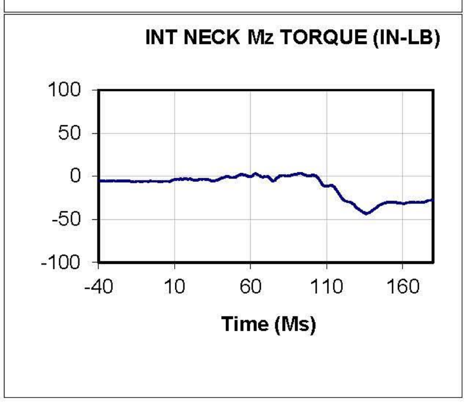
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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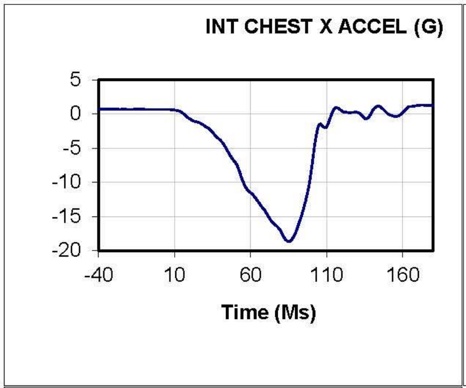


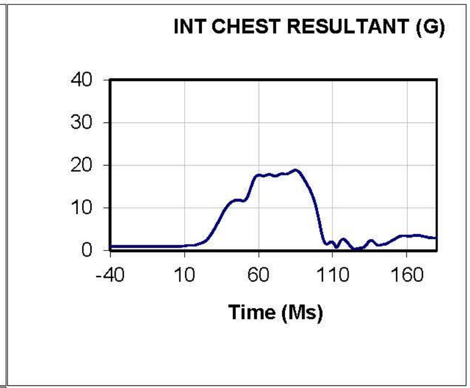


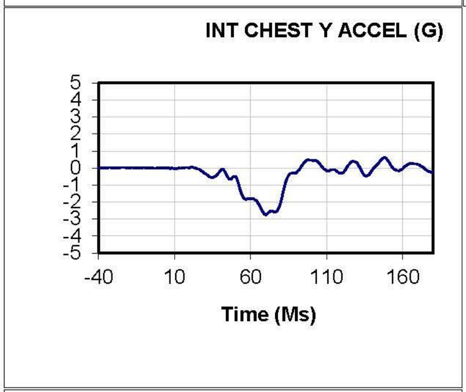


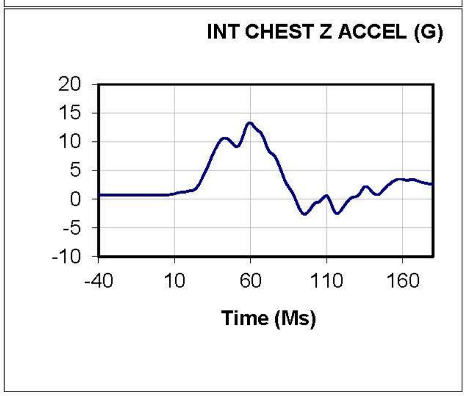


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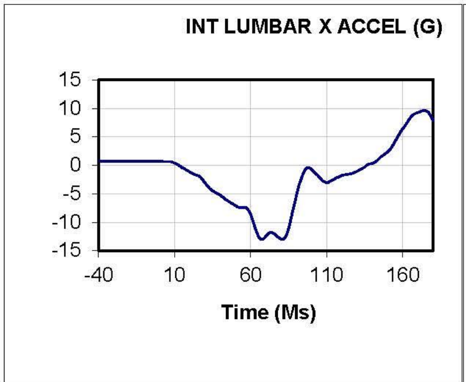
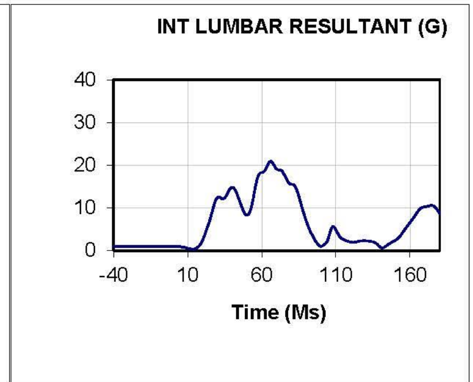
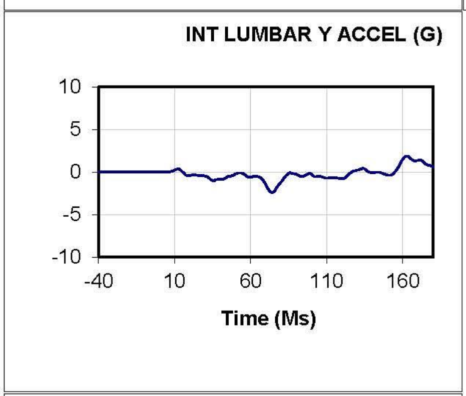
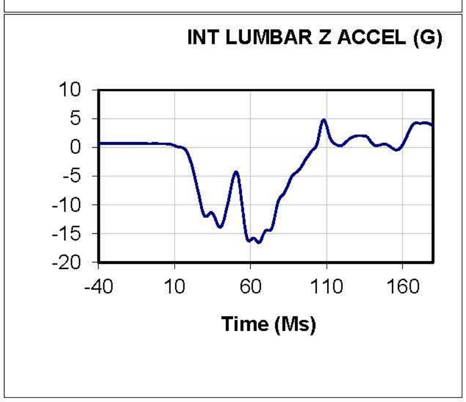
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

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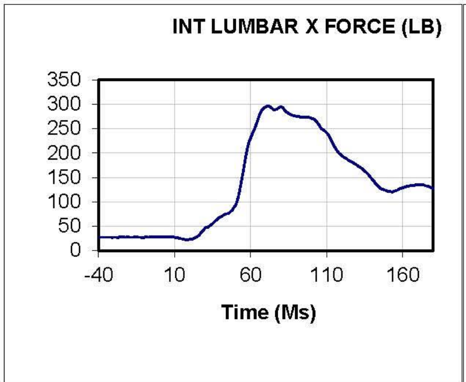
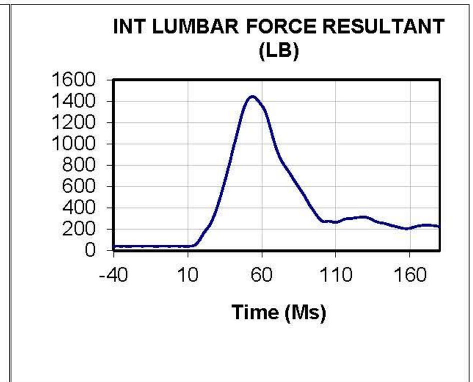
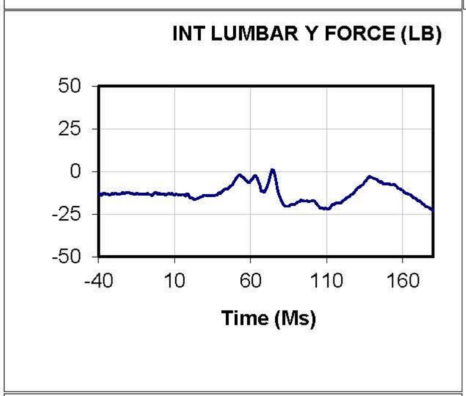
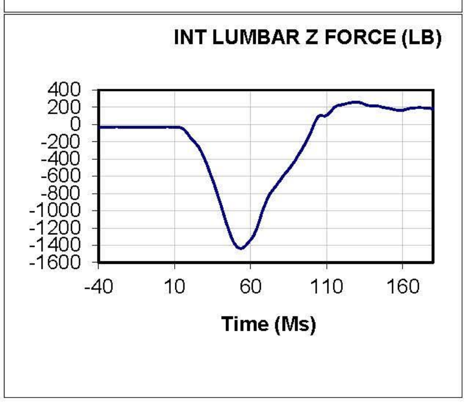
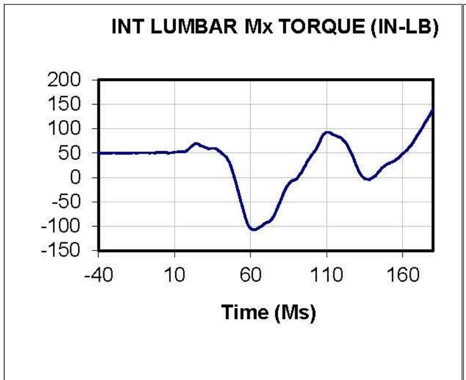
201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15

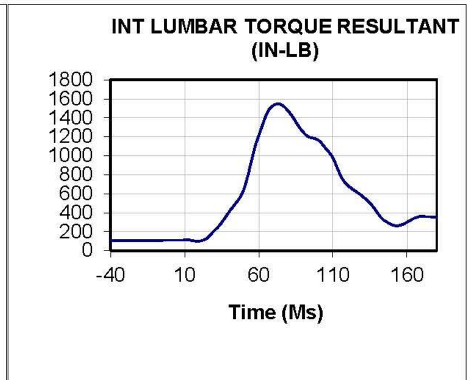


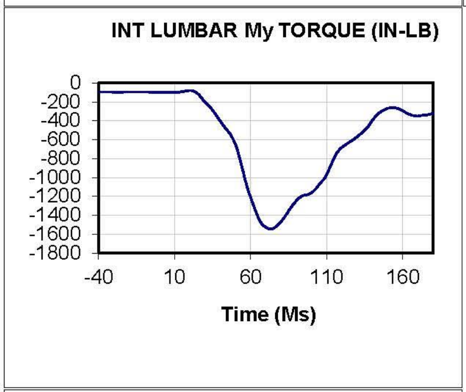



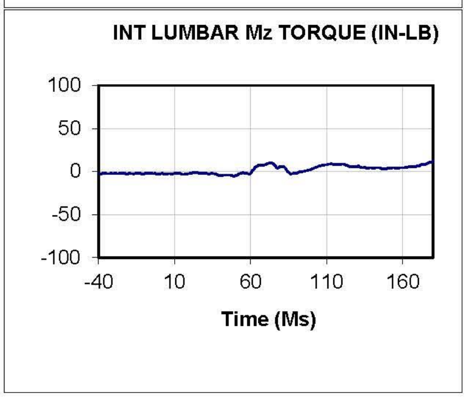



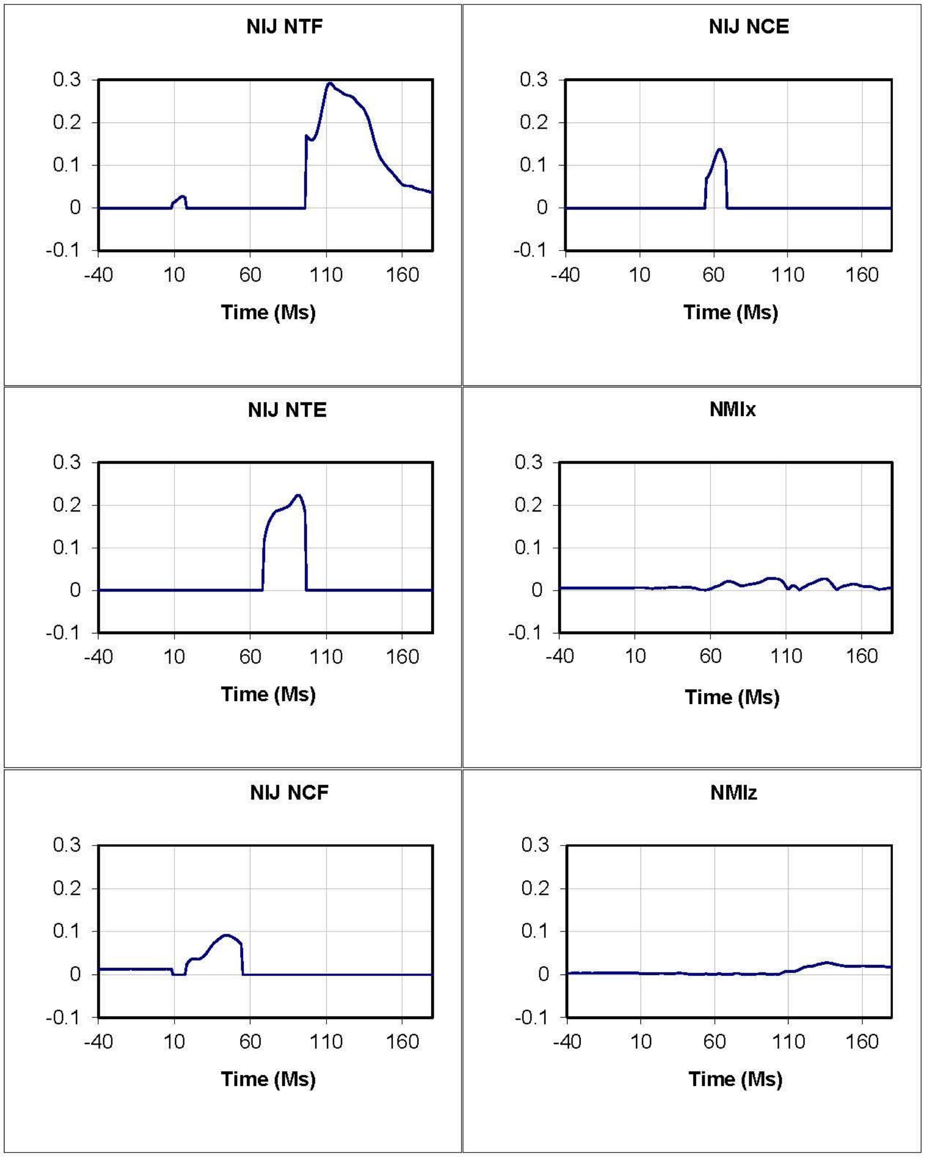

INT LUMBAR Mx TORQUE (IN-LB)
200
150
100
50
0
-50
-100
-150
-40
10
60
110
160
Time (Ms)


INT LUMBAR TORQUE RESULTANT (IN-LB)
1800
1600
1400
1200
1000
800
600
400
200
0
-40
10
60
110
160
Time (Ms)


INT LUMBAR My TORQUE (IN-LB)
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-40
10
60
110
160
Time (Ms)


INT LUMBAR Mz TORQUE (IN-LB)
100
50
0
-50
-100
-40
10
60
110
160
Time (Ms)

201404 Test: 9030 Test Date: 150312 Subj: LARD Cell: W15



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